VOLUME: II
PAGES: 1-261
EXHIBITS: 15-39

IN THE CHANCERY COURT OF JACKSON COUNTY, MISSISSIPPI

MIKE MOORE, ATTORNEY GENERAL ex rel, STATE OF MISSISSIPPI,
Plaintiffs,

vs.

THE AMERICAN TOBACCO COMPANY; AMERICAN BRANDS, INC.; R.J. REYNOLDS TOBACCO COMPANY; RJR NABISCO, INC.; BATUS CORPORATION; BROWN & WILLIAMSON TOBACCO CORPORATION; PHILLIP MORRIS COMPANIES, INC.; PHILLIP MORRIS, INCORPORATED (PHILLIP MORRIS USA); LIGGET GROUP, INC.; LIGGETT & MYERS, INC.; BROOKE GROUP, LIMITED; LOEWS CORPORATION; LORILLARD CORPORATION; THE COUNSEL FOR TOBACCO RESEARCH-USA, INC.; THE TOBACCO INSTITUTE, INC.; HILL & KNOWLTON, INC.; CORR-WILLIAMS TOBACCO COMPANY; GENERIC PRODUCTS CORPORATION; LAUREL CIGAR & TOBACCO COMPANY, INC.; LONG WHOLESALE, INCORPORATED; THE LEWIS BEAR COMPANY; WIGLEY & CULP, INC. OF GULFPORT, MISSISSIPPI; "A" THROUGH "Z" ENTITIES (M.R.C.P. 9(h)),
Defendants.

Property of: Ness, Motley
Main PI File Room
Charleston, SC

CONTINUED DEPOSITION of PROFESSOR RICHARD PETO, a witness called on behalf of the Defendant, R.J. Reynolds Tobacco Company, taken pursuant to notice, before Debra D. Lajoie, Registered Professional Reporter/Certified Shorthand Reporter #116693, and Notary Public in and for the Commonwealth of Massachusetts, at the offices of Connarton, Wood & Callahan, 150 Federal Street, Boston, Massachusetts, on Wednesday, October 23, 1996, commencing at 10:02 a.m.

ROBERT H. LANGE CO., INC.
Professional Court Reporting Services Since 1958
50 Congress Street
Boston, Massachusetts 02109
617-523-1874 • 800-645-6807 • Fax 617-523-7343
Experts in every technological service

COPY
http://legacy.library.ucsf.edu/tid/frq07a00/pdf
Document hosted at www.industrydocuments.ucsf.edu/docs/msgl0001

APPEARANCES:

Ness, Motley, Loadholt, Richardson & Poole,
(by Charles W. Patrick, Jr., Esq.),
151 Meeting Street, Suite 600,
P.O. Box 1137,
Charleston, SC 29402,
on behalf of the Plaintiffs;

Jones, Day, Reavis & Pogue,
(by Theodore M. Grossman, Esq.,
and Randolph L. Burns, Esq.),
North Point, 901 Lakeside Avenue,
Cleveland, OH 44114,
on behalf of the Defendant,
R.J. Reynolds Tobacco Company;

Shook, Hardy & Bacon,
(by Keith T. Borman, Esq.),
One Kansas City Place, 1200 Main Street,
Kansas City, MO 64105-2118,
on behalf of the Defendant,
Lorillard Tobacco Company.

http://legacy.library.ucsf.edu/tid/frq07a00/pdf
Source: https://www.industrydocuments.ucsf.edu/docs/msgl0001

I-N-D-E-X

WITNESS: DIRECT (Continued)

PROFESSOR RICHARD PETO 5

NO.	EXHIBIT	PAGE
15	Document	20
16	Questionnaire	63
17	Study	71
18	Article	99
19	Transcript	105
20	JAMA article	108
21	Chart	124
22	Chart	128
23	Chart	131
24	Chart	134
25	Chart	137
26	Chart	139
27	Chart	140
28	Chart	144
29	Chart	147
30	Chart	150
31	Chart	152
32	Chart	155
33	Chart	156

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Powered by http://www.industrydocuments.ucsf.edu/docs/msgl0001

I-N-D-E-X (Continued)

NO.	EXHIBIT	PAGE
34	Chart	159
35	Chart	160
36	Article	178
37	Chart	220
38	Chart	222
39	Chart	236

---

http://legacy.library.ucsf.edu/tid/frc07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

P R O C E E D I N G S

THE VIDEOGRAPHER: Today's date is October 23rd, 1996. The time is approximately 10:02 a.m. The tape is rolling.

The videographer present is Craig Newman, employed by Valed Video Services in Boston.

MR. GROSSMAN: Thank you. Before we begin, perhaps we could give our appearances.

My name is Ted Grossman. I'm a lawyer appearing here on behalf of R.J. Reynolds Tobacco.

MR. BURNS: I'm Randy Burns, also for R.J. Reynolds Tobacco Company.

MR. BORMAN: I'm Keith Borman for Lorillard Tobacco Company.

MR. PATRICK: My name is Charles Patrick. I am appearing on behalf of the Plaintiff, Mike Moore. I'm with the law firm of Ness, Motley, Loadholt, Richardson & Poole in Charleston, South Carolina.

THE WITNESS: I'm Richard Peto, Professor of Medical Statistics and Epidemiology at the University of Oxford.

PROFESSOR RICHARD PETO, having been duly sworn, testified as follows in answer to direct

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

interrogatories by Mr. Grossman:

Q. Good morning. I just have a few housekeeping things before we get in to new areas of testimony.

Mr. Peto, have you been provided with any documents by the Plaintiffs since we last met?

A. All I got was a transcript, which I looked through, very briefly and signed. Other than that, I've had this paper here, which is a photocopy of an article in "Science" this week on the effects of benzopyrene.

Q. All right. Who provided that to you?

A. I believe that it was either you or one of your colleagues that did so.

MR. GROSSMAN: Mr. Patrick?

MR. PATRICK: Right.

Q. All right.

A. Nothing else, no.

Q. Had you asked for it?

A. Yeah.

Q. So --

A. In fact I had asked for it, but they didn't know that.

Q. Yeah, you had asked for it separately unrelated to the litigation?

http://legacy.library.ucsf.edu/tid/frq07a00/pdf
Source: https://www.industrydocuments.ucsf.edu/docs/msgl0001

A. Yeah.

Q. Have you had a chance to read it?

A. Only briefly.

Q. You continue to believe that epidemiology rather than toxicology is the principal basis upon which to determine the extent to which cigarettes cause risk to humans?

A. Yes. I think that studies like this may help in the use of any mechanisms, but the cause and effect relationship I think was clearly demonstrated before this.

Q. By epidemiology?

A. Yes.

Q. And you continue to believe that cigarette smoke is most appropriately viewed as a whole mixture, is that correct, rather than as a --

A. Well, that's how the epidemiologist has to view it, except that you cannot distinguish between cigarettes with differing tar levels, or you could look at filtered or nonfiltered cigarettes.

So you can look at cigarettes with particular characteristics, but the epidemiology looks at the effect of the mixture smoked as it is actually smoked.

Q. You testified at the first session of your

http://legacy.library.ucsf.edu/tid/frq07a00/pdf
Source: https://www.industrydocuments.ucsf.edu/docs/msgl0001

deposition that you were unimpressed with efforts to isolate individual components of tobacco smoke and try to assess the blame for the observed greater increase of lung cancer and other diseases among smokers as a result of those individual components rather than -- why don't we start the question again.

You testified at the first session of your deposition that you were unimpressed with claims made by certain individuals that particular components of smoke, rather than the complete mixture of smoke, could be isolated and viewed as the reason --

A. Or the single cause?

Q. Yes.

A. The efforts I've seen so far, yes, I think it's very difficult to sort these things out. I think we can find cancer-causing chemicals, but we can find so many of these that it's difficult to know which ones are of major importance and which are of minor importance.

Q. And benzopyrene, which is referred to in that "Science" article that you were provided with, is present in many substances that are ingested by humans, isn't it?

A. Yes. I mean the principal source for a smoker

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

in western society would be cigarette smoke, but there would also be other sources.

Q. Well, hasn't the -- doesn't a single charcoal broiled steak have as much benzopyrene as --

A. That's what I was talking about, inhaled benzopyrene, for the lungs. I'm sorry.

Q. The principal source of benzopyrene for most people, including most smokers, is through food, is that correct?

A. I'm not sure of the amounts that would be present on broiled foods. Certainly you will get benzopyrene and a lot of other pyrolysis products, some of which may also be toxic.

Q. The -- I don't have the study with me because I didn't know that we would be addressing this issue, but a study by the Oak Ridge National Laboratory -- are you familiar with them?

A. I'm familiar with the Laboratory, yes.

Q. A study by the Oak Ridge National Laboratory a few years ago found that, even among smokers, more than 86% of the benzopyrenes that are absorbed by the body are provided by sources other than cigarettes.

You would have no reason to disagree with that, would you?

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

A. I have no knowledge of the study. I don't have any strong reason to disagree. It may be true. For inhaled of benzopyrene, then cigarette smoke would be the chief source. For total, there would be other sources, yes.

Q. And people who charcoal grill, for example, inhale very large amounts of benzopyrene when they charcoal grill, is that correct?

A. In the smoke from the actual grilling?

Q. Yes.

A. Yes, though I don't know quantitatively how much that would be on a sort of year long basis, what sort of fraction that would be. I would image that would be considerably smaller than one would get from cigarette smoke.

Q. Those who are professional barbecuers and who stand over charcoal grills daily would have a large amount of inhaled benzopyrene without question, wouldn't they?

A. That is plausible. I don't know. I'd like to see the actual quantitative stuff. It's plausible. You've also got the question of duration.

If you want to look at long duration, you'd have to look at people who have been doing it for some

http://legacy.library.ucsf.edu/tid/frd07a00/pdf
Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

decades because the risks depend on the duration of exposure.

Q. If benzopyrene is the cause of the observed increase of lung cancer among smokers, then one would assume that the amount of benzopyrene in the atmosphere, particularly in people in certain occupations, such as grillers, would greatly increase the prevailing rate of lung cancer among nonsmokers, wouldn't one?

A. I think you -- one shouldn't talk about things as being the cause, firstly. I think you've got to talk as to whether it's a cause of most lung cancer deaths.

Cigarette smoke contains a variety of chemicals, and the question is whether benzopyrene is a cause of most of the toxic effects of a major part or of only a minor part. And if it is a major part, then people who got comparable amounts from other sources, inhaled sources, would be at appreciable risk, yes.

And I mean there is evidence that people who do get quite a lot of smoke, particularly coal smoke, do finish up with appreciable risks of lung cancer even if they don't smoke cigarettes. You can get coal smoke exposure that produces measurable lung cancer risks.

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: https://www.industrydocuments.ucsf.edu/docs/msgl0001

You can get coal smoke, really long-term chronic coal smoke exposure producing appreciable lung cancer risks in nonsmokers, but they're not comparable with those of smoking, but big.

Q. Is it fair to say that you remain unimpressed that any particular component of smoke has been identified as the cause or the principal cause of observed lung cancer in smokers?

MR. PATRICK: Objection to form.

A. I think I could answer that question or I could answer a -- could I try and answer it?

Q. Yes, yes.

MR. PATRICK: Go ahead.

A. There are so many chemicals in smoking, it seems to me unclear that any one particular chemical is going to be a cause of most of the toxic effects. That seems to be me at the moment to be unproven.

I know that people who do investigate particular chemicals often feel that the particular chemical they're investigating is, you know, the reason why cigarette smoke is so toxic.

But I think that it's very difficult to know this because we don't really know how to go from the laboratory to human evidence.

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

You can say that something is going to cause some risk, but whether it's going to cause a big risk or a small risk is very difficult to be certain of, and it doesn't seem to me that claims of really knowing what the chief toxins are justified.

Q. Okay.

A. But there may be claims based on evidence that I haven't reviewed that are justified, but certainly the evidence I've seen doesn't seem to justify really trying to sort out and apportion, you know, what fraction of the toxicity is caused by one chemical or by another.

And if chemicals act in synergy with each other, then, you know, it's never going to be possible really to sort out, you know, X percent from this, Y percent from this and a certain percent from this and getting it to add up to a hundred.

Q. Okay, thank you.

Now, another thing from your earlier deposition, or from the first session of your deposition, you referred many times to manufactured cigarettes, and you used that term --

A. Yes.

Q. -- and you also do in your literature?

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

A. Yes.

Q. You're referring to cigarettes that are made by manufacturers such as R.J. Reynolds or Philip Morris --

A. Yes.

Q. -- and that are sold in packages --

A. Yes.

Q. -- as opposed to self-rolled cigarettes?

A. Yes, because self-rolled cigarettes are so variable in their composition, it's difficult -- it's more difficult to study them.

Q. Now, currently manufactured cigarettes have greatly reduced tar deliveries over cigarettes of the early 1950s and before?

A. Yes.

Q. In 1956 in the United States, the average tar delivery of cigarettes was about -- was almost 40 milligrams, is that correct?

A. Yes. I don't remember exactly, but somewhere 30, 40 milligrams is at least the standard estimates, yes. And nowadays it would be about 10 milligrams or thereabouts.

Q. And that reduction has been accomplished by filters and by porous papers and by expanded tobacco

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Document from www.industrydocuments.ucsf.edu/docs/msgl0001

and by a number of other technological innovations?

A. Yes.

Q. Self-rolled cigarettes that are still smoked rarely but are still available throughout the world would not have those technological innovations, is that correct?

A. No, nor would they have some of the additives that are used to produce continued burning, so they're quite different, and it's difficult to predict what the net effects would be.

Q. Is it fair to say that it would not be wise for people who smoke manufactured cigarettes to switch to self-rolled cigarettes for health reasons?

A. I'm sorry. I don't know. But the problem is it's difficult to know what the risks on the self-rolled ones are, it's difficult to get people who have some really consistent habit long term. So I don't really know.

I thought that, comparing the manufactured cigarettes of today with the manufactured cigarettes of a few decades ago, it seems to me that there is fairly strong indirect evidence that the lung cancer risks are somewhat lower now from a given habit than they were a few decades ago.

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

But for the nonmanufactured ones, I think it's difficult to be certain. Sorry.

Q. That's all right.

From the evidence you've seen, if individuals roll cigarettes using tobacco that has been marketed for self-rolled cigarettes and regularly smoke those cigarettes, are there net health risks that differ significantly from unfiltered cigarettes that traditionally were sold in the marketplace?

A. They might be different, yes. They might really be very different because, I mean, for the same reasons that we reviewed last time, little odd quirks of the manner in which the cigarette is smoked can substantially affect the risk.

And it's very difficult to predict exactly how things will be smoked, you know, the intermittent, you know, smoking for a bit and then letting the thing go out and then relighting it is going to produce, you know, different chemistries.

I mean it's difficult to know whether it's going to be higher risk, lower risk, what it's going to be. It could be either. And also, different hand-rolling strategies, different hand-rolling methods might well finish up with very different risks.

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

I think the hand-rolled cigarettes are difficult to characterize and, therefore, haven't been studied properly on their own. I think the good -- the reliable evidence is really on the effects of manufactured cigarettes. That was why I tried to make that distinction.

Q. All right. You testified at the first session of your deposition about the use of questionnaires to determine the degree in a society of cigarette using.

You have written about that, as well, haven't you?

A. What, saying that questionnaires can yield misleading estimates of the overall change in --

Q. Yes.

A. Yes. If you -- for example, in a society, if you have people and you just do a question before smoking has been very much in the news, you do questions about what people smoked, then they may give you reasonably straightforward answers.

But then if there were to be, say, a decade or so of propaganda, you know, saying smoking kills people, smoking kills people and then you go back and ask again, then it might have more effect on what they say they smoke than on what they actually smoke.

So you could get misleading answers as to, you

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

know, the effects of various social changes on the number of cigarettes smoked. I think you've got to tie these things in to national sales figures.

And also, if you're asking about the past, people don't remember what they smoked at various times in the past, and you've got to tie questions about what people used to smoke, you've got to tie them to the national sales figures. The sales figures -- the national sales figures I think are probably reasonably reliable because they're used for fiscal purposes.

Q. Now --

A. And the questionnaires can just give you a guide as to, given that total sales, who smoked what, you know, whether it was the males, the females, the old, the young, et cetera, et cetera.

Q. So it's fair to say that questionnaires seeking recall of quantitative smoking habits in the distant past are notoriously unreliable, and even questionnaires about current habits may be subject to large errors?

A. It depends what you're trying to use them for. If you were trying to use questions about what people smoked to try and work out the total number smoked in a country, then you'd finish up

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

underestimating. You know, the total number of cigarettes that people say they smoked would be substantially less than the total sales. So for that purpose, they would be unreliable.

But for other purposes, trying to sort people out in to, say, light, moderate and heavy smokers, they would be of some value, although even then, there's some classification error.

But you can show that there is some value in sorting people out in to light, moderate and heavy smokers by asking a questionnaire, then taking blood and measuring things like cotinine, which is a nicotine --

Q. Yes.

A. -- breakdown product in that blood, and you can show that their replies on the questionnaire do correlate with what you measure in the blood.

So the questionnaires are useful for that purpose and that they're really pretty good at sorting out smokers from nonsmokers.

So notoriously unreliable is too strong. I wouldn't agree with that, except for the purposes of trying to assess national trends. If you were trying to look at national, you know, national figures, then I

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

think they would be.

MR. GROSSMAN: Could we get out the avoidable risks of cancer in the U.S.?

Would you mark this? What number were we up to? Let's see. This would be 15.

(Document marked Exhibit No. 15 for identification.)

MR. GROSSMAN: Off the record.

(Discussion off the record.)

MR. GROSSMAN: On the record.

Q. Let me hand you what has been marked for identification purposes as Peto Deposition Exhibit No. 15. That's a work you're familiar with, isn't it, Doctor?

A. Yes. I was a co-author of this.

Q. You wrote that with Richard Doll?

A. Yes.

Q. And it's entitled, "The Causes of Cancer" --

A. Yes.

Q. -- "Quantitative Estimates of Avoidable Risks of Cancer in the United States Today"?

A. Yes.

Q. It was published in 1981?

A. Yes.

http://legacy.library.ucsf.edu/tid/frq07a00/pdf
Source: https://www.industrydocuments.ucsf.edu/docs/msgl0001

Q. Let me direct your attention, if I may, to Page 1293, Footnote 1, at the bottom of the page.

A. Yes.

Q. That says -- I'll just read it in to the record -- "Questionnaires seeking recall of quantitative smoking habits in the distant past are notoriously unreliable, and even questionnaires about current habits may be subject to large errors.

"For example, data from four large questionnaire-based surveys, 1964, 1966, 1970, 1975, suggest about a 15% reduction between 1964 and 1975 in the number of cigarettes smoked per U.S. adult, but this reduction is probably chiefly due to progressive increases in underreporting because no such large trends are evident in the more reliable data on the number of cigarettes actually manufactured. By 1975, 50% more cigarettes were being sold than the questionnaire surveys indicated were being smoked."

A. Yes.

Q. Does that quoted language continue to accurately reflect your understanding of the utility of questionnaires in relationship to sales data?

A. To national sales data?

Q. Yes.

http://legacy.library.ucsf.edu/tid/frq07a00/pdf
Source: https://www.industrydocuments.ucsf.edu/docs/msgl0001

A. Yes, particularly in terms of what's going on in the past. You've got to be really quite careful to tie what you say in to the national sales where these are available, and then of course in some populations you have the problem of smuggling, so --

Q. So underreporting could be as high as 50%, you've found?

A. That's -- the actual 50% is citing, I think, Ken Warner's study, but certainly, yes, you can get quite a lot of underreporting, I don't know whether exactly 50%, but certainly substantial.

But if were going to go in to the past, then it could be even more misleading.

Q. And you would describe the underreporting, first of all, to a failure of memory with regard to distant events?

A. I don't know what it is. But efforts have been made to reconstruct the past total sales of cigarettes by asking people now alive what they used to smoke, and these just haven't matched at all the sales figures.

Well, to say haven't matched at all is a bit too strong, but they haven't really matched at all satisfactorily the total sales figures, for example,

http://legacy.library.ucsf.edu/tid/frq07a00/pdf
Source: https://www.industrydocuments.ucsf.edu/docs/msgl0001

the large increase during World War II and so on in U.S. sales figures. So clearly the reconstructed past histories can be misleading.

I think you can use the questionnaires as a guide as to how to split up the total sales. That's the main thing.

Q. Is one of the reasons for that also that people have received health warnings and believe that they don't want to admit, in many cases, how much they've smoked?

A. Possibly. I don't know. That might be more true now than it used to be in the past. It used to be a fairly morally neutral question.

Q. Are you familiar with circumstances where questionnaire data overestimates the amount of smoking in a society?

A. Yes. If you take a society where there's been a big increase in smoking and some time after that increase you ask people what they used to smoke, then their answers sometimes tend to resemble their current habits and don't show how much less really used to be smoked at a time when reliable sales figures indicate that, you know, the total sales were not very large.

Q. Are you familiar with any studies that show

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

that contemporaneous smoking or contemporary smoking is overestimated in questionnaire responses in relation to sales figures?

A. Overestimated? I don't know of any. Are there some? I don't know.

Q. I don't know of any either. I'm just asking you.

A. No, I don't think so. No, I don't know of any. I think it varies from time to time.

Q. All right. If there are not studies showing overestimates by a society using questionnaires of the amount that they currently smoke, what do you think might account for the difference that we saw last -- at the last session of your deposition between the sales figures for Japanese cigarettes in 1965 and the amount reported to have been smoked by Japanese men in response to questionnaires at that time?

A. I'm sorry. I don't know. I'd like to be reminded of the responses to the questionnaires and the actual sales figures, if I could, please.

MR. GROSSMAN: I don't know if I have them here. Just one moment.

Yeah, let's go off the record for one moment.

THE VIDEOGRAPHER: 10:28, going off the record.

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

(Discussion off the record.)

THE VIDEOGRAPHER: 10:30, back on the record.

Q. Professor, that was on Exhibit 1, which apparently is not with us, so I'll continue on to a --

A. Yes.

Q. -- different issue.

I gather it's your testimony that, because of the very large relative risks that have been found for cigarette smoking and lung cancer and certain other diseases, the use of questionnaires does not inject significant error in determining whether cigarette smoking causes lung cancer?

A. It would tend, if anything, to weaken the association. If you start getting a few smokers misclassified as nonsmokers, then you know, those you classify as nonsmokers will finish up getting lung cancer because they're including some people who are really smokers, and so that would tend to weaken the association.

If you could really get a perfect split between complete life-long nonsmokers and people who smoked cigarettes regularly since say just before the start of adult life, then you'd get a more extreme difference.

So on the whole, the mix-ups that you get through

http://legacy.library.ucsf.edu/tid/frq07a00/pdf
Downloaded from www.industrydocuments.ucsf.edu/docs/msgl0001

inaccuracies in questionnaires will tend to weaken the relationships. Probably to judge by studies on cotinine, the main sort of error is between light smokers and heavy smokers, rather than between smokers and nonsmokers.

So the smoker-versus-nonsmoker comparison is probably only slightly weakened by misclassification, whereas, the difference in risk between say light, moderate and heavy smokers might be quite substantially distorted by misclassification.

Q. All right. So if I understand you correctly, given the large reported relative risks --

A. Yeah, smoker versus nonsmoker.

Q. -- Of smoker versus nonsmoker for a disease such as lung cancer --

A. Yeah.

Q. -- the error that may be injected as a result of questionnaire responses that are not accurate is not sufficient to affect in any way your opinion as to the effect of cigarette smoking on lung cancer?

A. Well, it would actually go the other way. I mean it would actually -- errors would actually weaken the association. So when you get a 20-fold relative risk despite some misclassification, you can say that

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

the real relative risk is at least 20-fold, possibly more.

Q. But where the relative risk is very low, as in environmental tobacco smoke, and reported literature on environmental tobacco smoke --

A. Yes.

Q. -- misclassification could inject a significant source of bias, couldn't it?

A. It'll tend -- you'd expect it to weaken the relationships, you know, if there was a real relationship, and if you could get people really reliably classified in to those totally nonexposed and those persistently exposed, then you might find something more clearly measurable.

But you know, because of the problems of classifying people as really long-term exposure, it's -- you know, it's more difficult.

Q. Okay. The record's not clear on this. If nonsmokers -- let me start that again.

If smokers, people who have smoked occasionally or more, are classified as nonsmokers for purposes of environmental tobacco smoke surveys, that could inject a significant source of error in trying to assess the relative risk --

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

A. Yes.

Q. -- of environmental tobacco smoke?

A. Yes.

Q. And the use of questionnaires, in your estimation, has over time demonstrated that there is some misclassification of smokers as nonsmokers, is that correct?

A. Yeah. You're talking really about ex-smokers as life-long nonsmokers.

Q. Yes.

A. Yeah, there must be some misclassification of ex-smokers as life-long nonsmokers, yes.

Q. And particularly with regard to past smoking history, there are significant quantitative differences between what people have said they've smoked and what in fact they did smoke?

A. That's among active smokers, yes.

Q. And among former smokers, as well, presumably, is that correct?

A. Yes, I would imagine so, among those who say they were former smokers. I mean the problem with the passive smoking epidemiology is -- would be if people said that they had never smoked when in fact they had.

So among people who say they've -- if you're

http://legacy.library.ucsf.edu/tid/frq07a00/pdf
Source: https://www.industrydocuments.ucsf.edu/docs/msgl0001

trying to look at previous sales, then you've got the never smokers, the ex -- the self-described never smokers, the self-described ex-smokers and the self-described smokers, and you can ask the self-described what they used to smoke and the self-described smokers what they used to smoke, and it'll be the errors in those that are the main source of the problem.

There wouldn't be very much problem produced by errors in the self-described nonsmokers because probably they really did smoke very little in aggregate. But when looking at environmental tobacco smoke, then that could be more of a problem, yes.

Q. And you earlier referred to cotinine, which is a metabolite of nicotine?

A. Yes.

Q. And sometimes tests are made of an individual's blood or urine to determine it if they have cotinine in the blood or urine and, by that, to determine their exposure to smoke?

A. Yes, you can measure -- it's their recent exposure, or the advantage of that is that you can also measure passive exposure because it's so sensitive.

Q. But a test for cotinine in the blood would not

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

tell you anything about whether a person was a smoker five years ago or ten years ago?

A. No.

Q. That's correct?

A. It wouldn't really tell you anything about whether they were a smoker ten days ago.

Q. And so environmental tobacco smoke surveys that attempt to segregate life-long nonsmokers from smokers using cotinine measurements, contemporary cotinine measurements, are misguided in believing that they can make such a separation on the basis of current measurements?

A. What they can do is exclude those who are currently smoking and who misreport themselves as not smoking. That's what that does. It picks out those who are currently smoking, but it would not discriminate between ex-smokers and life-long nonsmokers.

Q. And it's your view that the misclassification bias is greater for ex-smokers than for current smokers in ETS literature?

A. I would imagine that that's the case, but it's difficult to know. It's difficult to be certain, but I would imagine that that is the case, yes.

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

Q. And where one is dealing with such small relative risks as have been reported from that environmental tobacco smoke, the presence of such bias can be a significant confounding factor, is that correct?

A. It could in principle be, yes. That makes it difficult to actually do reliable epidemiology on the effects of environmental tobacco smoke.

As I said I think last time, the key evidence that environmental tobacco smoke kills some people is the fact that active smoking kills lots of people, and so it's an indirect argument. I think that's the key argument.

Q. It's indirect and by analogy?

A. I don't know whether I'd use the word analogy. Extrapolation anyway. I think extrapolation rather than analogy.

Q. Well, to the extent that that hypothesis has been sought to be tested through epidemiological surveys, the epidemiological surveys to the present time, at least, have not demonstrated a clear link between environmental tobacco smoke and cancer, is that correct?

A. From what I've seen, they've demonstrated a

http://legacy.library.ucsf.edu/tid/frq07a00/pdf https://www.industrydocuments.ucsf.edu/docs/msgl0001

link that is statistically significant if you take all of the data, not only the American studies, but also the non-American studies, I believe, but I don't think -- I think that what I should be testifying here is really on the effects of smoking, rather than the effects of environmental tobacco smoke because it's what I'm more expert on.

Q. Yes.

A. I think on environmental tobacco smoke, you'd probably better get somebody else.

Q. Okay. And you don't view yourself as someone who is either going to testify as to environmental tobacco smoke or someone who views himself as particularly expert on that subject?

A. Except in endorsing the statement in the IARC report that, since smoking kills lots of people, environmental tobacco smoke must kill some people. I would endorse that.

But other than general epidemiological knowledge, I wouldn't want to go very much beyond that because I've not recently reviewed in detail the studies which are available on environmental tobacco smoke.

Q. Professor, do you know what the Miller model is?

http://legacy.library.ucsf.edu/tid/frq07a00/pdf
Source: https://www.industrydocuments.ucsf.edu/docs/msgl0001

A. The Miller model?

Q. Yes.

A. Do you mean the idea that carcinogens get oxidized and that, when they're partially oxidized, then they're capable of binding to DNA?

Q. No. No. I'm referring to an economic model. Are you familiar --

A. I'm sorry. That's the Miller model as to how the carcinogens in tobacco smoke actually cause cancer when they're partially oxidized. It's Miller and Miller.

Q. Okay. Are you familiar with the Miller model for economics?

A. No.

Q. All right. And obviously, you're not testifying on that, is that correct?

A. I don't know what it is, unless it's something that I do know but being given another name.

Q. Now, it's your testimony, isn't it, that lung cancer does not comprise the majority of deaths that you attribute to smoking?

A. In the United States?

Q. In the United States.

A. In societies like the United States, you know,

http://legacy.library.ucsf.edu/tid/frq07a00/pdf
Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

it would be of the order of about a third but varying a bit from society to society.

Q. Probably heart disease kills more people as a result of smoking, according to your testimony, than any other disease?

A. Yeah. Putting it another way around, smoking probably kills more people by heart disease than it kills by lung cancer in societies such as the United States where you've got high background risks for coronary heart disease. It wouldn't be true in societies with low background risks of coronary heart disease.

Q. Now, obviously, many factors affect heart disease?

A. Yes. What smoking does, it takes whatever background you have and then multiplies it up.

Q. And many factors affect overall mortality rates?

A. Overall mortality rates, many different diseases, yes.

Q. Among the lifestyles and exposures that -- let me start that question again.

Apart from smoking, what factors have been shown to be causative or likely causative of heart disease?

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

A. Well, it depends whether you'd think of things like blood cholesterol and blood pressure as factors. I mean these are internal causes. But you know, then you've got to say what are the external causes of high blood pressure or high blood cholesterol.

So if we'll take those as causes, then blood pressure and, therefore, indirectly those things that affect blood pressure; blood LDL cholesterol and, therefore, those things that affect blood LDL cholesterol; and then --

Q. What about the absence or the inadequacy of HDL cholesterol?

A. I was just going to put that next on the list.

Q. Okay.

A. You've got an inverse relationship with HDL cholesterol, which I think is likely to be causal, and might well account for the apparently protective effects of alcohol or for a substantial part of the apparently protective effects of alcohol.

Q. What are the causes of high blood pressure?

A. First I think there are probably causes that we don't know about. Obesity is a cause of high blood pressure, excessive salt intake is a cause of high

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

blood pressure, and it's been claimed that the intake of medium-chain saturated fats is a cause of high blood pressure. I'm not -- I don't know whether this is true or not. Those are the ones that are most commonly cited, I believe.

Q. And what are the causes of high LDL cholesterol?

A. Well, again, I think there are causes of high LDL cholesterol that we don't know about. I would -- I think dietary factors are the most plausible candidates.

The amount of cholesterol that you eat in your diet is probably only a fairly minor determinative of blood LDL cholesterol. The chief determinants would be -- the chief determinants that have been reasonably well characterized are the types of fat in your diet.

It's the types of fat more importantly than the amount of fat, rather curiously, with you know, the saturates, particularly the medium-chain saturates increasing LDL, the polyunsaturates probably actually reducing LDL cholesterol and the monounsaturates possibly being intermediate between these two.

Q. And what are the causes of low HDL cholesterol?

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

A. As far as I know, these aren't very well understood. Some of the factors I just listed as causing high LDL cholesterol also seem to cause low HDL cholesterol, but some of them actually work in the opposite direction, but these are much more minor effects. The chief effects of these dietary things are on LDL.

Alcohol, if you drink alcohol, let's say a moderate amount of alcohol, on most days, then that will reduce your HDL cholesterol. That's one of the most widely publicized causes.

Q. Now, Doctor --

A. If you increase total fat, then -- actually, no. I'll pull that one out, I'll withdraw that, because the effects are very marginal.

Q. If we could just go over some of these. Obesity is linked with heart disease and is also -- also increases relative risk for premature death generally, is that correct?

A. Well, it depends how fat you get, yes. When you get well beyond, well above average weight, then going further towards obesity carries a risk of death, yes, carries an increased risk of death.

But when you get right down to the bottom end,

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

then you may get a sort of minimum mortality, and then you go to higher mortality as you go to even leaner body weight.

Q. The more one exceeds the basic range of appropriate body weights, the greater risk one has for premature death?

A. There's always the tautology. You define appropriate as being that, that minimizes for the risk of premature death, then if you go above it, then you're going to have increased risk.

Q. And the greater the extent that you go above it, the greater the risk?

A. In total, yes.

Q. And that is both through heart disease and through other diseases, isn't that correct?

A. Yes, heart disease and other diseases. Yes, there's -- there is an effect, yes.

Q. People who eat a diet high in saturated fats run an increased risk of heart disease and premature death by other diseases, is that correct?

A. Yeah, it's principally -- it's principally, as I understand it, the effect on LDL cholesterol and the effect on obesity and, hence, on blood pressure.

Q. But people who do eat a diet high in saturated

http://legacy.library.ucsf.edu/tid/frq07a00/pdf
Source: https://www.industrydocuments.ucsf.edu/docs/msgl0001

fats are running an enhanced risk of death?

A. Yes, other things being equal. You've got to put in this other things being equal. If there's any substantial increase in saturated fat intake in a society such as this where people have already got sort of adequate nutrition and enough energy, then yes.

Q. Now, Type A personalities have also been linked with premature death by heart disease, is that correct?

A. Yes.

Q. The lack of --

A. I'm not sure how reliable these findings are, actually.

Q. With regard to Type A personality?

A. Yes. Whether it's Type A personality or whether it's actually particular things that people do, it's not clear that the personality itself has an effect over and above the effect that it has on, you know, what you eat, what you drink, what you smoke and, you know, whether a drive -- your car at high speed.

So it's not clear that it has any effect of itself, at least it is not clear to me. I've never seen anything that's really demonstrated this very satisfactorily. It's difficult to allow for the extent

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

to which the personality effects habits and lifestyle.

Q. So it's difficult -- Type A personality may correlate with other lifestyle factors?

A. Yes, it may affect how you live and, thereby, affect your risks of death from various diseases.

Q. People with Type A personalities due to nervous anxiety may smoke more or may drink more or may eat differently or may drive faster or may do a number of other things, all of which correlate with premature death?

A. Yes, although it depends how much more you drink. I mean moderate drinking actually correlates inversely with premature death, so you may have a minimum of let's say one or two drinks a day.

Q. So to put it somewhat differently, there may be a concordance of risk factors, and by tracking Type A personality, one may be measuring in fact the wrong thing?

A. Yes, it may be that one's talking about the personality where you should be talking about the exposures.

Q. Because the Type A personality correlates with the exposures and it's the exposures that cause the increased risk of death?

http://legacy.library.ucsf.edu/tid/frq07a00/pdf
Source: https://www.industrydocuments.ucsf.edu/docs/msgl0001

A. Yes, it may be that the personality doesn't itself have any intrinsic effect really.

Q. All right. Now --

A. That's not clear, though. It really isn't clear whether it does or doesn't. It's just one of those things that people have had great difficulty sorting out.

Q. A sedentary lifestyle, the absence of leisure exercise, has been linked with premature death, hasn't it?

A. Yes. And exercise has been linked with the avoidance of heart disease. Again, this is one that's -- that may be somewhat oversold as a hypothesis.

Q. If one wanted to check --

A. That's why I didn't list exercise as being of proven relevance to heart disease when you were asking for causes because, again, it's not clear to me how important or relevant it is as an independent risk factor.

Q. When you studied British doctors' smoking habits and other things over the last 40 years or more, you made no account for the degree to which those doctors exercised or didn't, is that correct?

http://legacy.library.ucsf.edu/tid/frq07a00/pdf http://www.industrydocuments.ucsf.edu/docs/msgl0001

A. We did a questionnaire halfway through the study where we asked a lot of aspects about the way they lived and trying to look at, you know, differences between those who were then smoking and those who weren't, and it was during the 1970s. I'm not sure of the exact year.

Q. The original questionnaire didn't ask --

A. No.

Q. -- the doctors how much they exercised, is that correct?

A. No.

Q. And later questionnaires did not ask them how much they exercised, is that correct?

A. I believe that the questionnaire in the 1970s did. It certainly asked a lot of different features. It was about a four-page questionnaire with quite a lot of things asked in it. I'm sorry. I don't remember whether exercise was among them.

We were just trying to see if there were any striking differences between, you know, those who smoked and those who didn't.

Q. What did you find?

A. The main thing that stood out was drink. They were more likely to -- they were more likely to use

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: https://www.industrydocuments.ucsf.edu/docs/msgl0001

alcohol than those who didn't.

Q. Of the questions that you asked in the mid 1970s, you found that smoking correlated with drinking alcohol?

A. Yes.

Q. And more --

A. That's among British doctors, yeah.

Q. That's among British doctors. And the more British doctors smoked, the more likely they were to drink alcohol and the greater amount of alcohol they were likely to drink?

A. Yes, I believe that both of those were true.

Q. Did you ask about dietary habits among British doctors?

A. We asked whether they'd changed their diets, whether they deliberately tried to change their diet, I believe, but again, there wasn't very much correlation of that answer. The trouble is that doctors are very difficult to assess reliably by questionnaire.

Q. Did you ask them how much fatty food they ate?

A. No, because it's not -- it's very difficult to characterize people's diet. You can characterize their smoking. With more difficulty you can characterize their drinking. It's extremely difficult to

http://legacy.library.ucsf.edu/tid/frq07a00/pdf
Source: https://www.industrydocuments.ucsf.edu/docs/msgl0001

characterize the diet reliably.

We've done other studies to try and look at the relationships between coronary risk factors and smoking, not in this particular one, but you know, for example, we've done a study recently with about 20,000 blood samples, questionnaires, and then we can look at the relationship between the questionnaire replies and what we see biochemically in the blood. I mean this we've done.

So that wasn't done within the study of British doctors, but looking at the patterns of confounding the differences between the smokers and the nonsmokers, they're not very great in terms of blood biochemistry.

Q. In the study that you conducted?

A. Yes, that was 20,000 people in Britain.

Q. And when was that conducted?

A. A few years ago, about 1990.

Q. Was it published?

A. Yes, it was published. I think the first author was Sarah Parrish. It was published in the "British Medical Journal" a year or two ago.

Q. All right. Did you ask about -- ask the British doctors about their use of green leafy vegetables or fruits, the degree to which they ate

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Downloaded from www.industrydocuments.ucsf.edu/docs/msgl0001

fruit, portions of fruit a day or portions of green leafy vegetables?

A. Certainly in the main questionnaire -- in the earlier questionnaires, definitely not. I cannot remember the detail if it was asked in the questionnaire in the 1970s. If -- I think we didn't.

Certainly if we did, nothing striking came out of it because we did try and correlate the various answers that we got with their habits, and there really wasn't anything terribly striking coming out.

Q. But you don't recall whether you asked that question or not?

A. No. I'm sorry. I don't recall the 1970s questionnaire exactly.

Q. Now, another factor that has been widely reported to correlate strongly with premature death is education, is that correct?

A. Yes.

Q. At our last session, I provided you with an editorial from "The New England Journal of Medicine" by Marcia Angel that referred to an article by Pappas and others.

A. Yes.

Q. Have you had an opportunity to review the

http://legacy.library.ucsf.edu/tid/frq07a00/pdf
Source: https://www.industrydocuments.ucsf.edu/docs/msgl0001

Pappas article? You said that you had wanted to.

A. Yes. I'm sorry. I have not done so between now and then.

Q. All right. I'll provide you with one later and --

A. Thank you.

Q. -- we'll come back to this.

A. The advantage of the British doctors is that they've got fairly similar educational patterns. That's one advantage of studying doctors, that it reduces the heterogeneity with respect to some of the characteristics.

Q. In studying the British doctors the difference in educational background would not account for significant differences in mortality rates because they all had essentially the same educational background?

A. Well, I'd say a lot more similar than a sample of the general population would have been.

Q. They're also more similar in terms of income, is that correct?

A. Yes, especially in Britain.

Q. Yes. They're all from essentially the same social class and have -- and from the same quintile of income, is that correct?

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

A. I'm not sure, but I mean doctors on the whole are going to have enough money to live on, so --

Q. They are going to have enough money to live on?

A. Yeah.

Q. And they're going to do better than the average person?

A. Yes, there's more homogeneity within doctors than there is within the general population, which has advantages and disadvantages in terms of epidemiological research.

Q. But other studies have shown that income strongly correlates with premature death, is that correct; that is, that the higher one's income, the more likely one is to live a long life?

A. In general that's true, yes.

Q. And the lower one's income, the more likely one is to die young, particularly of heart disease, as well as other diseases, is that correct?

A. That might well vary from culture to culture, and it -- you know, you could actually have it either way around, you can have -- I mean, for example, in China at the moment, I suspect it'll be the better of the Chinese who are going to have the higher risk of

http://legacy.library.ucsf.edu/tid/frq07a00/pdf
Source: https://www.industrydocuments.ucsf.edu/docs/msgl0001

dying from coronary heart disease and the less well off would have the lower risk.

Q. And that's because, in China, the -- it's only the well off who have access to saturated fat products, is that correct?

A. It's probably the diet of the poor Chinese is really very, very limited and it's going to be maybe all plants. They'd have very low average cholesterol and quite low coronary heart disease rates.

Q. But in the United States and some other western countries, low income correlates significantly with premature death?

A. Yes, it does now. And for heart disease, it might have been different patterns for heart disease in the past. I'm not sure.

Q. But today low income correlates with heart disease in the United States?

A. Yes.

Q. Now, access to and use of preventive care also correlates with premature death, is that correct?

A. Use of? It depends what you mean, preventive medicine, I mean, you know, what are we talking about?

Q. Yes. People who have -- people who have access to doctors who can assess conditions before they

http://legacy.library.ucsf.edu/tid/frq07a00/pdf
Source: https://www.industrydocuments.ucsf.edu/docs/msgl0001

become significant are more likely to live long lives than people who don't see doctors regularly but only when an emergency arises?

A. Yeah, this could be a partly an income thing, as well.

Let's take a particular disease. Could we stick with coronary heart disease, or do you want to try and take mortality as a whole?

Q. Let's take mortality as a whole.

A. Of course that's such a mixture of different things, and the extent to which, you know, if you try to ask whether people go along and, you know, see their doctors on a regular basis, you know, how that would actually correlate with social class, how it would actually correlate with mortality in the States, I don't know.

You could finish up with people of, you know, with sort of, if you'd like, low social class. I don't know what term you want to use, low income, low -- they might have contact with quite extensive medical services. I don't know. I think it would vary from place to place.

You can find circumstances where the poor finish up with more contact with doctors rather than less, so

http://legacy.library.ucsf.edu/tid/frq07a00/pdf
Support for www.industrydocuments.ucsf.edu/docs/msgl0001

I don't know how contact with doctors would correlate with disease patterns.

Q. Okay. So it's fair to say it's something that you haven't studied and that --

A. The extent to which contact with doctors is, of itself, protective. It depends whether there are studies about what doctors can do that would be protective.

Q. Obviously, the prevalence of infectious disease correlates with increasing mortality rates, does it not?

A. The prevalence of infectious disease correlates -- well, it depends which disease.

Q. In --

A. There are certain diseases that are common among the upper social classes even.

Q. Well, let me break it down. In societies that have a greater proportion of hepatitis B, there will be a greater death rate as a result of that and --

A. Yes.

Q. -- as a result of diseases that may come from it, is that correct?

A. Yes, hepatitis B is a major cause of death.

Q. In societies that have increased --

http://legacy.library.ucsf.edu/tid/frq07a00/pdf https://www.industrydocuments.ucsf.edu/docs/msgl0001

A. In China, for example.

Q. In societies that have increased prevalence of tuberculosis, there will be a higher death rate as a result of it and as a result of diseases that may come from the tuberculosis itself, is that correct?

A. Yes, I mean tuberculosis kills people. In the absence of tuberculosis, you're not going to get deaths from TB. That's -- I mean both of these are diseases that -- where the effects may be aggravated by smoking.

For example, hepatitis B causes, particularly chronic hepatitis B infection causes liver cancer, and it may be that its effects as a cause of liver cancer are aggravated by the effects of tobacco smoke, and there are some studies that suggest this, there's a research question which suggests it.

Tuberculosis death rates seem to be higher among smokers than among nonsmokers. That was found in the British doctors, for example, in the early days when British doctors still had risk if dying of TB so, it's -- you know, yes, these diseases can cause death and in some societies are very large causes of death.

Q. All right. Doctor, let's turn to the extent to which smokers, as a group, differ from nonsmokers,

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Document from www.industrydocuments.ucsf.edu/docs/msgl0001

as a group.

You said earlier that you found, in the British doctors survey, that those British doctors who smoked, as a group, drank more alcohol than British doctors who did not smoke.

A. Yes.

Q. And because of that, you have written, have you not, that any estimate of the medical effects of one needs to take in to account the effects of other?

A. It would be preferable if it did so. I mean it depends how accurately one's trying to make the estimates. I mean, you know, it's not that any estimate that doesn't do that is totally invalid. That would be a misquotation.

But if you've got information about both of them, then it would be preferable to look at the one standardized for the other if information on both is available, but you could do perfectly good studies on smoking that didn't take account of drinking.

Q. Well, in your study, 13-year follow-up on your study of mortality in relation to consumption of alcohol --

A. Yes.

Q. -- you said, at Page 913, "Drinking and

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

smoking habits tend to be correlated, so that any estimate of the medical effects of one needs to be -- to take account of the effects of the other."

You don't disagree with the statement that you wrote there, do you?

A. If it were taken out of context and used to say that any study of smoking that didn't also take account of the effects of alcohol was invalid, then I would disagree with it, yes.

It's in the context, you know, where we've got information on both, then it's preferable to adjust to one when looking at the effects of the other, and particularly because the alcohol has a much, much smaller effect than smoking, you really do need to adjust for smoking when trying to estimate the effects of alcohol.

It's less important to do it the other way around because the effects of smoking are so big that it doesn't make so much difference if you don't adjust for alcohol.

Q. Now, with regard to diet, smokers have been found to have a different diet than nonsmokers in a number of studies, is that correct?

A. I would imagine that they would do, yes. I

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

mean it would be surprising, I would say, if they didn't.

Q. Smokers, as a group, often are less health-conscious than nonsmokers, is that correct?

A. I don't know. I don't know. It depends what you mean by health-conscious. Do you mean they would self-medicate with over-the-counter vitamins less or what or -- I mean it may well be that smokers are really quite worried about the extent to which they're putting themselves at risk, in which case, they'd be more health-conscious. What do you mean?

Q. Well, you have written that part of the association between smoking and vascular disease may well be due to other differences between U.S. smokers and U.S. nonsmokers, is that correct?

A. Yes, there could be. I mean you could have -- but we did actually investigate this in the paper by Parrish, et al, of which I was a co-author, where we took about 20,000 controls, where we took about 10,000 smokers, 20,000 controls, and we got blood biochemistry, as well, and there wasn't any big difference in -- well, APO B, which is the surface marker for LDL cholesterol, there wasn't much difference between smokers and nonsmokers in APO L1,

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

which is the -- which is a marker for -- the surface marker for HDL cholesterol.

Q. In the Parrish study, what cohort was being studied, what group?

A. These were -- there were two groups. There was one, people who'd recently had a nonfatal heart attack, these were the cases, so had recently had a nonfatal heart attack.

And the controls were sort of general population who hadn't had a heart attack at all. So it was a case control comparison with -- I can't remember the exact number. There was about 10,000 cases, about 20,000 controls, but big numbers.

Q. It was a case control comparison made in England?

A. In the United Kingdom, yes.

Q. Was it all social groups?

A. Yes.

Q. Now, in the United States, have you studied the difference in diet between smokers and nonsmokers?

A. No, but --

Q. Others have?

A. There must be differences in diet between smokers and nonsmokers, I would imagine. It would be

http://legacy.library.ucsf.edu/tid/frq07a00/pdf
Source: https://www.industrydocuments.ucsf.edu/docs/msgl0001

surprising if there weren't.

Q. And some of those differences in diet could account for part of the difference found in the rate of vascular disease between smokers and nonsmokers?

A. Yes, that's right. It could go either way, though. I mean it could actually finish up that it limits the effect -- the apparent effect of smoking, rather than increasing it.

Q. And once again, as with alcohol, if one has information about the dietary habits of smokers versus nonsmokers, it would be well to control for that in determining relative risks, isn't that correct?

A. If you had -- if you've got really reliable evidence about differences in diet, then it would be interesting to look at the effects of controlling for it, yes.

And if the differences between smokers and nonsmokers in, for example, heart disease were really quite slight, then, you know, one could have been rather more doubtful as to whether or not the effect is real, but because they're fairly extreme, particularly in early middle age, I think it's easier to be confident that most of the apparent effect of smoking is real.

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

So it may or may not be really important to control for it.

Q. It may or may not be important to control for it to determine whether the apparent effect is real, but controlling for it will produce a more accurate relative risk, is that correct? Is that your testimony?

A. It might do. It depends on what we're controlling for. If we're controlling for things that are associated with smoking and don't have any independent association with diet, well, it doesn't really matter very much, you know, what you control for.

And the things that we know that really do effect particularly coronary heart disease, should show up particularly in the blood lipids. That's where they should show up. That's why, you know, you can actually get some idea of the extent to which there are differences between smokers and nonsmokers in the dietary determinants of heart disease by looking at the blood lipids, as we did in that paper by Parrish, et al.

Q. Now, low socioeconomic status, low education, low income both correlate with smoking in the United

http://legacy.library.ucsf.edu/tid/frq07a00/pdf
Source: https://www.industrydocuments.ucsf.edu/docs/msgl0001

States, is that correct?

A. I believe it does at the moment, yes. It used not to, but it seems to -- I believe it does now, yes.

Q. And both low education and low income also correlate with premature death by heart disease and a number of other diseases, is that correct? That's been your testimony?

A. Yes, although, again, some of that correlation may well be due to the differences in the smoking patterns. I mean one of the big differences between the rich and the poor -- if you -- I don't know quite how you put it -- low socioeconomic status, is that the poor smoke a lot more than the rich, and that's going to make them die at a higher rate.

Q. But you have written, have you not, that even among nonsmokers, many diseases are inversely related to social class --

A. Yes.

Q. -- as is smoking?

A. Yes.

Q. And because of that, in the CPS II study by the American Cancer Society, part of the excess mortality among smokers may be due to factors other than tobacco?

http://legacy.library.ucsf.edu/tid/frq07a00/pdf
Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

A. Yes. Yes. What I'm trying to do in answering your questions is trying to, you know, trying to avoid saying that something must always be adjusted for and then having that taken out of context and applied, you know, applied elsewhere where it's not appropriate. That's why I'm trying to be so, you know, pernickety a little bit. But yes, I would agree with that.

Q. But I mean it would be better, all other things being equal, it would be better to adjust for social class in trying to determine the relative risk for heart disease or other diseases from smoking, is that correct?

A. It could be done quite easily within the CPS II study.

Q. Yes.

A. And I suspect that when it is done, the results will not be greatly altered, but it would be very easy to request analyses from them which were adjusted and analyses which were not adjusted.

Q. But it could be done with the CPS II study because the CPS II study tracks income, as well as smoking habits, is that correct?

A. It asks questions which are moderately good, moderately informative about social class. Exactly how

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

informative they are, I don't know. Determining social class is very, very difficult to characterize.

Q. It is likely that the relative risks that would be determined after adjusting for education and income would be more accurate than the relative risks determined without such an adjustment, is that correct?

A. Probably, yes. If you -- yes, probably. Now, I doubt whether they would be very much different, though.

Q. You have not personally made such an adjustment in the CPS II database, is that correct?

A. Correct.

Q. Now, the British doctors database would not afford you much of an opportunity to make adjustments for income or social class for the reasons that we discussed before, is that correct?

A. Because of the homogeneity, the relative homogeneity of doctors, as opposed to the general population, yes.

Q. Now, the CPS II database, unlike the British database -- British doctors database, involved a large set of questions that were asked at the beginning of the survey and maintained throughout the survey

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

involving not only smoking but a variety of other factors affecting lifestyle, is that correct?

A. No. The British doctors study, at its beginning in 1951, asked simple questions only about smoking. In 1957, again, simple questions only about smoking. The same in '66. During the 1970s, a more extensive questionnaire was administered, and this included alcohol and various other things.

Q. The questionnaire in the 1970s was the only time during that period when British doctors were asked about lifestyle factors other than smoking, is that correct?

A. Yes.

Q. The CPS II study --

A. No. I'm sorry. We had done it again recently in the 1990s, but it's the only thing that's relevant to any of publications in which that happened.

Q. And the CPS II study, on the other hand, began by asking the respondents in the cohort over 60 questions about lifestyle, is that correct?

A. I don't know. You tell me how many it was. I'm sorry. It was a lot anyway. It was a four-page questionnaire that was really quite dense.

Q. And that questionnaire asked about smoking

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

habits?

A. Yes.

Q. It asked about income?

A. I'm sorry. I don't know the exact list of questions that were asked.

Q. All right.

A. I have the questionnaires in my office, but I don't have them with me.

Q. If one had access to the CPS II database, one could determine, first of all, the degree to which smokers differed from nonsmokers with respect to all of the many questions asked, is that correct?

A. Yes.

Q. For example, one could tell the difference -- to the extent that there were questions about education, one could compare the education level of the smokers, as a group, with the nonsmokers, as a group?

A. Yes.

Q. One could compare the income level of the smokers, as a group, with the nonsmokers, as a group?

A. Yes.

Q. To the extent that it asked about drinking, one could compare the drinking -- the amount that smokers drank with the amount that nonsmokers, as a

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

group, drank?

A. The analyses have been done.

Q. Yes. And it could also compare the degree to which people reported they exercised?

A. I don't know. If that's in there, then yes, you'll have to tell me what's in there.

Q. All right. I'll go through some of those with you, and I'll put them in front of you.

I can tell you that in the CPS II study, individuals were asked whether they --

MR. GROSSMAN: Let's take a break for a minute. Off the record

THE VIDEOGRAPHER: 11:15, going off the record.

(Recess at 11:15 a.m.)

(Questionnaire marked Exhibit No. 16 for identification.)

(Resumes at 11:30 a.m.)

MR. GROSSMAN: Back on the record.

Q. Mr. Peto, let me hand you --

THE VIDEOGRAPHER: 11:30, back on the record.

Q. Let me hand you what has been marked for identification purposes as Peto Exhibit No. 16.

A. Thanks.

Q. Professor, what I've handed you is the

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

questionnaire for men from the CPS II study of the American Cancer Society. Have you ever seen this before?

A. Yes.

Q. And you recognize it as the questionnaire for men of the Cancer Prevention Study II of the American Cancer Society?

A. Yes. There was one for men and one for women, wasn't there? This was the one for men.

Q. And the one for women is substantially identical, except for questions --

A. Yeah, specific female diseases.

Q. -- regarding sexual organs?

A. Yeah.

Q. Let me ask you a few questions about the CPS II study.

The study was of somewhat over a million individuals in the United States?

A. Yes.

Q. It was conducted by the American --

A. Cancer Society.

Q. -- American Cancer Society?

A. Yes.

Q. The individuals at the American Cancer

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

Society who were responsible for the CPS study were Lawrence Garfinkel and Steven Stellman?

A. Yes. There may have been others, as well. I don't know.

Q. Certainly Lawrence Garfinkel had --

A. They were involved.

Q. Excuse me?

A. Both of those two were substantially involved in it, yes.

Q. And they had oversight responsibility for it?

A. I believe so.

Q. And they would be authoritative as to the composition of the CPS II database?

A. They would know what the questionnaire consisted of. Whether they'd be authoritative -- whether they would be authoritative about the composition of the database, no, I don't know, but of the original, yes, unless they ceased to be associated with it when the ACS moved down to Atlanta.

Q. And they would be -- and Mr. Garfinkel would be authoritative with regard to the calculation of the results of the CPS II database?

MR. PATRICK: Objection. Lack of personal knowledge.

http://legacy.library.ucsf.edu/tid/frq07a00/pdf https://www.industrydocuments.ucsf.edu/docs/msgl0001

A. Yeah, I think I can't really answer that because I don't know what his involvement is nowadays. I mean it's several years since handed over responsibility for this to Clark Heath and Mike Tune, so they would be the ones who would be authoritative now. Whether he still is or not, I have no idea.

Q. Lawrence Garfinkel, until two or three years ago, was the head of statistics for the American Cancer Society?

A. I don't know when he ceased being -- he was an epidemiologist working in the Cancer Society. I don't know the exact name of his position or when he ceased to hold it.

Q. It's your understanding that, in his capacity at the American Cancer Society, he made calculations of the results of the CPS II study?

A. I think he did tabulations of the baseline evidence, yes. I don't know what else he's done on analyses of the CPS II. I thought there was a lot work done on after it went down to Atlanta and that it wasn't until work was done that the main results could be analyzed, and so I would have thought that would have been after he ceased to be associated it. I'm not sure.

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

Q. He's published widely on his tabulations of the results of the CPS II study?

A. Has he?

Q. Have you read his publications?

A. On the CPS II?

Q. Yes.

A. No. Most of what I've seen on the CPS II has been from the people down in Atlanta. He's published a lot on the CPS I, Garfinkel has.

Q. And on the CPS II, as well? Are you familiar with any?

A. It may be. I mean I've dealt with the people in Atlanta in relation to CPS II.

Q. Okay.

A. I've dealt entirely with the people in Atlanta.

Q. Mr. Peto, let me direct your attention to Exhibit 16, to the CPS II questionnaire.

The questionnaire asks a variety of diseases about -- a variety of questions about the history of disease on the front page --

A. Yes.

Q. -- and about family history in relation to cancer?

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: https://www.industrydocuments.ucsf.edu/docs/msgl0001

A. Yes.

Q. It also has extensive questions on the second page about smoking regarding the age when the individual started smoking, if he did, the age when he quit, extent to which he believed he inhaled, the size and type of cigarettes and the rest?

A. Yes.

Q. On the third page it contains extensive questioning about diet, is that correct?

A. Yes.

Q. It asks, for example, the portions -- the times per week that the individual eats certain kinds of fried food or whether the person refrains from all fried food entirely?

A. Yes.

Q. And it asks about the days per week that the individual eats a couple of dozen different kinds of food?

A. Some number, yes, about that.

Q. Whether the person eats a vegetarian diet?

A. Yes.

Q. Whether the person has had a modification in his diet in the last -- major modification in the last ten years?

http://legacy.library.ucsf.edu/tid/frq07a00/pdf
Source: https://www.industrydocuments.ucsf.edu/docs/msgl0001

A. Yes.

Q. And it asks about the consumption of various kinds of alcohol, as well as other beverages?

A. Yes. Where is that? Excuse me.

Q. That's in the upper right-hand corner of Page 3, Question 8.

A. Oh, yeah, right.

Q. It also asks about medications and vitamins?

A. Yes.

Q. And on the fourth page it contains a number of questions regarding the occupation of the respondent --

A. Yes.

Q. -- including the respondent's contact with certain occupational exposures, such as asbestos, coal dust, diesel engine exhaust, wood dust and other things?

A. Yes. Wood dust is here, is it? Yes, right.

Q. It also asks about demographic information regarding the respondent?

A. Yes.

Q. It asks whether the person -- it asks the religion of the person, correct?

A. Yes.

Q. It asks the highest level of education,

http://legacy.library.ucsf.edu/tid/frq07a00/pdf
Source: https://www.industrydocuments.ucsf.edu/docs/msgl0001

correct?

A. Yes.

Q. And it even asks at the end whether the person has ever used mouthwash?

A. Yes. That means alcoholic mouthwash, I presume.

Q. Excuse me?

A. That means alcoholic mouthwash, I presume.

Q. Yes. And you presume that that question relates to laryngeal carcinoma?

A. Yes, cancer of the mouth/throat.

Q. All right. Now, with regard to the composition, the demographic composition of the database, it's your understanding, is it not, that the million or so respondents to the CPS II study were members of the American Cancer Society, their family and friends?

A. Yes. So that would have been a nonrandom sample of the population.

Q. It was not random, and it was also not representative of the United States at large, is that correct?

A. Yes.

Q. In fact, the --

http://legacy.library.ucsf.edu/tid/arqu7a00/pdf - industrydocuments.ucsf.edu/docs/msgl0001

MR. GROSSMAN: Let's mark this as 17.

(Study marked Exhibit No. 17 for identification.)

Q. Mr. Peto, let me hand you what has been marked for identification purposes as Peto Deposition Exhibit No. 17, which is a copy of a study entitled, "Smoking Habits and Tar Levels in a new American Cancer Society Prospective Study of 1.2 Million Men and Women," by Steven Stellman and Lawrence Garfinkel --

A. Yes.

Q. -- published in the JNCI.

I would direct your attention, if I may, to the second page, Table 1, "Distribution of Main Demographic Factors."

A. Yes.

Q. According to this -- and this would be authoritative with regard to the composition of the CPS II database, would it not?

A. Yeah. I mean there might be tiny differences in the last decimal point, but essentially, yes.

Q. Mr. Peto, 2.7% of the males in this database were Mormons?

A. Is that -- Latter Day Saint, yes.

Q. Yes. 3.7% of the --

http://legacy.library.ucsf.edu/tid/frq07a00/pdf http://www.industrydocuments.ucsf.edu/docs/msgl0001

A. Well, at least 2.7% describe themselves as such.

Q. Yes, describe themselves as Mormons.

3.7% of this database describe themselves as black, among men?

A. Yes.

Q. .8%, 0.8% of this database described itself as Hispanic?

A. Yes.

Q. Now, ethnically that is not --

A. It's not the sort of proportions that would be seen in the United States as a whole.

Q. It's a larger proportion of Mormons, is it not?

A. I don't know.

Q. Okay. But far smaller proportion of blacks than would be seen in the United States as a whole?

A. Yes.

Q. Far smaller proportion of Hispanics than would be seen in the United States as a whole?

A. Yes, although I don't know what the proportion of Hispanics is, but it must be more than 1.8%.

Q. Mr. Peto, with regard to regard to education in Table 2, 18.8% of the men who were respondents in

http://legacy.library.ucsf.edu/tid/frq07a00/pdf http://www.industrydocuments.ucsf.edu/docs/msgl0001

this survey had graduated from graduate school?

A. Yes.

Q. That is not at all representative of the United States as a whole, is that correct?

A. I'm not sure what graduate school means in this context. This means after you've done your college degree?

Q. Post college, yes.

A. It's after?

Q. Yes.

A. Okay. We'd call that postgraduate, yeah. Yes, that must be more than the national average.

Q. In fact, among the men, almost 60% of the respondents had attended some college, 20.6 had attended some college, another 17.8% had graduated college and another 18.8 had gone on to what you'd call postgraduate education?

A. Yes.

Q. That is not at all representative of the United States as a whole, is that correct?

A. I would imagine not.

Q. In fact, the composition of the CPS II database represents essentially the top quintile of socioeconomic status in the United States, is that

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

correct?

A. No. It would represent some from other groups, as well, but it would be weighted substantially towards the -- you know, those of higher socioeconomic status. I mean I suspect it would have -- I mean it's going to have virtually nobody from skid row. That's one extreme.

Q. Yes. And essentially it has people who are in the highest level of education and income in the United States by and large?

A. It's obviously going to be substantially above average anyway. Quintiles, I don't know, but certainly it's being going to be well above average.

Q. Also, the database composed of doctors, their families, other American Cancer Society members and their families and friends would include a population that was more health-oriented than the population at large, is that correct?

A. Probably, yes. I mean I would think the fact that they were prepared to take part this would suggest that to be the case.

MR. PATRICK: Let me just make an objection here. I don't have any objection to your going in and asking the doctor -- or the Professor questions concerning his

http://legacy.library.ucsf.edu/tid/frq07a00/pdf
Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

knowledge of the database and to the extent that it may be relevant to the formation of opinions that he may have about the American Cancer Society study.

But the American Cancer Society is not a party to this litigation, they are not represented, and I would object to the use of this record being the basis of any future attempt to obtain the results or to obtain the actual database from the American Cancer Society, although -- and I don't know the purpose for which this is -- the questions are being asked, but at this point --

Q. Professor, you rely upon the CPS II study in many of your analyses of smoking and health, is that correct?

A. Yes, we've used them as one of the main underpinnings for this book.

Q. For the Peto, Lopez, et al, book?

A. Yes.

Q. And for your 1992 "Lancet" article?

A. Yes.

Q. And for various other publications that you have --

A. Chiefly these things.

Q. All right. Now, despite the size of the

http://legacy.library.ucsf.edu/tid/frq07a00/pdf
Source: https://www.industrydocuments.ucsf.edu/docs/msgl0001

cohort, the CPS II cohort is not representative of the United States as a whole, correct?

A. Yeah. It has nothing to do with despite the size. It isn't representative. It is a large cohort, but it isn't representative. So you can compare with people in this cohort with other people in this cohort when you're trying to find out whether cigarettes kill people, but you can't expect this group to have death rates comparable with those of the general population of the United States.

Q. And in fact, the death rates of this group are not comparable with those of the --

A. No. They're substantially lower, but that's partly because somebody who's already ill and, you know, likely to die in the near future would be less likely to have been recruited. So it's a sort of -- it's partly a socioeconomic status thing, it's partly that disease itself might actually reduce the likelihood of recruitment as two separate effects.

Q. Have you undertaken any studies to determine the extent to which the database was compromised by a failure of people who believe themselves to be ill to join in the study?

A. Yeah, we ran an analysis that excluded the

http://legacy.library.ucsf.edu/tid/frq07a00/pdf
Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

first couple of years after the questionnaire to try and look at the relative risks. The will relative risks shouldn't be so greatly effected by this, you know, the ratio, because, you know, illness is going to exclude both smokers and nonsmokers, you know, so it shouldn't make an enormous difference to the relative risks. It was mainly the relative risks that we were looking for.

Q. But the absolute death rate among the nonsmokers and the smokers in the CPS II study can't be generalized to the United States because of the difference in the demographic features of the two, is that correct?

A. I think the absolute death rates in the nonsmokers might be, but the absolute death rates in the smokers might not be.

Q. Well, let me direct your attention, if I may, to your book, Peto, Lopez, et al, at Page A-48?

A. Yes. That was lung cancer that my last answer related to.

Q. Yes. I'm referring to absolute death rates, rather than death rate from any particular disease.

Page A-48, which includes your reprint from the"Lancer," on the first full paragraph, "For many

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: https://www.industrydocuments.ucsf.edu/docs/msgl0001

diseases, the absolute death rates among the nonsmokers and the smokers in the CPS II study cannot be generalized even to the United States, let alone to other populations."

That is correct, is it not?

A. Yes, with the qualification for many diseases. It's lung cancer I was trying to make an exception of.

Q. And the next sentence, "For example, the probability that a 35-year-old man will die before 70 is 34% at U.S. 1985 death rates but only 13% and 32% at the nonsmoker and smoker death rates in years three through six of CPS II."

A. Yes, and the reason we omitted years one to two was to try to omit those who -- you know, to omit years in which the results would have been substantially distorted by disease affecting the population of inclusion.

Q. Okay. And so by omitting those, the numbers that you have here reflect largely the socioeconomic status and other lifestyle factors apart from smoking of the CPS II cohort, is that correct?

A. I'm sorry. Could you repeat the question?

Q. Sure. By omitting the first two years after

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

the CPS II study was started --

A. We tried to limit the extent to which disease might distort the pattern.

Q. Because those who thought that they were dying at the time when the CPS II study started, you have --

A. Might have been less likely to join the study.

Q. -- you have speculated might have been less likely to join the study, and this was a way of controlling to avoid artifacts of that potential bias?

A. Yes.

Q. Okay. And having controlled to eliminate that potential bias, you note that, due to differences between the CPS II database and the United States as a whole, only 13% of nonsmokers and 32% of smokers in the database are likely to die by the age of 70, whereas, 34% of the United States as a whole is likely to die by that time, is that correct?

A. At 1985 death rates, yes.

Q. Now --

A. I must say we didn't -- to omit that, just the first two years, doesn't entirely get rid of this healthy volunteer effect. There's going to be some extent to which, you know, people could be ill for many years before death. So there's some selection, that

http://legacy.library.ucsf.edu/tid/frq07a00/pdf http://www.industrydocuments.ucsf.edu/docs/msgl0001

it's not just determined by socioeconomic status, I would imagine, particularly for things like chronic obstructive lung disease.

Q. It would be -- there is a potential, you're saying, for some bias in the numbers but the -- you've made your best efforts to eliminate that bias?

A. No, we haven't eliminated it. We've reduced it somewhat by omitting out the first year or two because, also, in the first year or two, those who are really sort of on the way out, you could have the disease actually causing them to stop smoking, as well, producing funny effects.

Q. In fact, the U.S. --

A. Particularly for lung cancer, though, omitting out the first year or two should deal with most of the problem.

Q. In fact, the United States death rate as a whole is outside the 95% confidence limits of the CPS II study, isn't it?

A. This isn't a chance difference.

Q. Yes.

A. I mean, you know, when we talk about a million people, this isn't a chance difference. The difference is real. They do have lower death rates than the U.S.

http://legacy.library.ucsf.edu/tid/frq07a00/pdf
Digitized by the Internet Archive www.industrydocuments.ucsf.edu/docs/msgl0001

as a whole, and that's not chance.

Q. And that's because, apart from smoking, they have differences in lifestyle, and there have differences in socioeconomic status, and they have a variety of other differences, is that correct?

A. Yes, and also, there is still probably some persistent healthy volunteer effect carrying over in to years three to six, I would imagine. A further difference is that the smokers in this study, many of them actually gave up smoking during 1980s, so the smokers wouldn't have had as great a risk as they would have had if they had continued.

Q. But they wouldn't have been counted as smokers, is that correct?

A. Yeah, they would have been counted as smokers in all these analyses --

Q. Yes.

A. -- because they're categorized by their original habits, but of those who were counted as smokers in these analyses quite a lot actually quit smoking by the end of the 1980s.

So if they -- and that would have reduced their risks, so had they continued, their risks would have been somewhat higher than they actually were. So it

http://legacy.library.ucsf.edu/tid/frq07a00/pdf
Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

would have been, you know, a bit higher than that 32% probably, had all the smokers continued to smoke.

Q. Even if the number had been a bit higher than the 32%, the difference between the CPS II group as a whole and the rest of the country is greater than the difference than is found in overall mortality between the smoking and nonsmoking parts of the CPS II cohort?

A. I'm sorry?

Q. The difference in life expectancy between smokers and nonsmokers in the CPS II cohort --

A. Oh, that 32% versus 13%?

Q. Yes. -- is not as great as the difference in life expectancy between the CPS II cohort as a whole and the United States as a whole?

A. No. It's greater. It's greater, isn't it? What you said is the opposite of --

Q. Oh, I'm sorry.

A. The difference between smokers and nonsmokers is 32, versus 13. And if we take this cohort as a whole, it would be some sort of mixture of the 32 and the 13, and that's going to differ less from the 34 than 32 does from 13.

Q. What is the -- well, let me see if I can address this a different way.

http://legacy.library.ucsf.edu/tid/frq07a00/pdf
Document hosted at www.industrydocuments.ucsf.edu/docs/msgl0001

Insofar as one can tell from the numbers themselves in the CPS II study, the death rate among smokers, particularly young smokers, 35 to 50 years old, in the CPS II study is lower than the death rate among nonsmokers in the United States as a whole?

A. We don't have very reliable data from CPS II until the age of 45. Essentially the CPS II data has only limited evidence on what happens at 35 to 44, and it's from about 45 upwards that the death rates become reasonably stable, if you look at the actual numbers.

Q. Well, even if one looks at the cohort of 45 to 55 --

A. Yeah, that would be much better because then the numbers would be stable.

Q. -- the death rate among the smokers in the CPS II cohort is significantly lower than the death rate among nonsmokers in the United States as a whole?

A. Is that true? Let's see. I'm sorry. I'm going to have to check whether that's correct as a whole.

Q. That's fine.

A. Can we take a particular age group? What age group do you want? Anything beyond 45.

Q. 45 to 55.

http://legacy.library.ucsf.edu/tid/frq07a00/pdf
Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

A. Okay, 45 to 55. Cigarette smokers -- and we'll stick with males, shall we?

Q. Yes.

A. So it's 430 and 698 in the cigarette smokers at 45 to 9, 50 to 54. And for the United States as a whole in 1985? 1985. 514 and 836.

What's true is that the death rate among the cigarette smokers in those age groups is lower than the death rate in the U.S. population as a whole. It's not clear that it's lower than the death rate among nonsmokers in the U.S. population as a whole, which is what you said. It's lower than the overall U.S.

But I must point out, though, that this is partly because there will have been still some residual effect of disease causing exclusion.

Q. A substantial part of that difference is clearly from the difference in socioeconomic status and lifestyle factors, apart from smoking, is that correct?

A. I would expect so, yes. And also, because the cigarette smokers didn't continue smoking. Had they done so, their death rates would have been higher. But a lot of the cigarette smokers in this study actually stopped before -- stopped in the 1980s.

http://legacy.library.ucsf.edu/tid/frq07a00/pdf
Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

Q. All right. Now, Doctor, from the CPS II questionnaire, it is possible for one who has access to the responses to determine the extent to which there is a concordance between smoking and a variety of other lifestyle conducts, is that correct?

MR. PATRICK: I'm going to object on the same basis as I made my previous objection.

MR. GROSSMAN: Your objection is noted, and we can take that as a continuing objection with regard to this entire line of questioning.

MR. PATRICK: That's fine.

MR. GROSSMAN: Off the record.

(Discussion off the record.)

A. Can you repeat your question?

Q. Yes. I'm sorry. Let's go back?

MR. PATRICK: Okay. We can talk at a break.

MR. GROSSMAN: No. We have no problem with your objection, and we can just leave it as it is.

Q. Professor Peto --

A. I've used the CPS II data as a source of information about the relative risks, the ratio between death rates --

Q. I understand that.

A. -- of the smokers and the nonsmokers.

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

Q. I understand that. I'm asking a different question.

If one has access to the CPS II database, one can determine the extent to which smoking is in concordance with other lifestyle conducts, such as exercise, diet, alcohol?

A. With those things that are determined in the questionnaire --

Q. Yes.

A. -- the original questionnaire?

Q. Yes.

A. Yes.

Q. So for example, one could find out the extent to which smokers, as a group, were exposed to asbestos, as compared to the extent to which nonsmokers were exposed to asbestos within this cohort?

A. You could assess the correlation between the two questions. I mean the real levels of exposure will not be perfectly determined by just a quick yes-no question like this --

Q. You could -- yes.

A. -- but you could relate the replies to these questions to the replies to the questions about smoking. That's particularly important when you come

http://legacy.library.ucsf.edu/tid/frq07a00/pdf
Source: https://www.industrydocuments.ucsf.edu/docs/msgl0001

to diet. So the questions about diet may be very poorly indicative of real dietary differences.

Q. But if, within these million respondents, there were significant differences in the way smokers answered their questions about diet and the way nonsmokers answered --

A. Then these differences could be picked up very easily because the numbers are so large, yes.

Q. For example, if nonsmokers in larger numbers said they ate no fried foods, that could be picked up, could it not?

A. Yes, for example, but it would give you a very poor indication of the relevance of -- well, I mean fried foods are thought to be relevant because of their effects on cholesterol and blood cholesterol, and really the way to find out the relevance or the relationship of smoking to blood cholesterol is to actually do a study where you pull blood, and that's, for example, the study that we did in Britain.

Q. Let me see if I understand this.

You're saying that a better way to determine the degree to which respondents have had a high-fat diet is to do blood studies?

A. We'll, you're interested in high-fat diet

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: https://www.industrydocuments.ucsf.edu/docs/msgl0001

because it affects the blood and it would be -- if you want to know the relationship between smoking and blood biochemistry, then it's better to pull -- you know, get a few thousand people, pull blood samples from them, and try and look at the mean LDL cholesterol, the mean HDL cholesterol, whatever, in those blood samples. The questions are very imperfect. Questions about diet are really very poor.

Q. One reason to find out about a high-fat diet would be to indirectly find out about blood cholesterol, another possible reason would be simply to find out the degree to which the respondents ate fatty foods and the extent to which the ingestion of fatty foods might be statistically related to other diseases, correct?

A. Yeah, that would be -- it would be a reasonable research activity if these questionnaires are answered consistently, and that is the next phase of the study, when they've gone back and asked 200,000 people a lot of information in more detail, and that's still actually being sorted out, and the database is still being cleaned up on that.

Q. Now, you have not made any attempt yourself to determine the concordance between smoking behavior and

http://legacy.library.ucsf.edu/tid/frq07a00/pdf
Source: https://www.industrydocuments.ucsf.edu/docs/msgl0001

the answers to these various other questions on diet and lifestyle in the CPS II study, have you?

A. With the exception of alcohol. Alcohol, yes, we did, although it's not mentioned in that paper.

Q. You said earlier, if you have information on the concordance between drinking and smoking or other lifestyle activities and smoking, one could more accurately assess a relative risk by controlling for them, correct?

A. Well, for drinking we did so, yes. I mean it was actually in the context of drinking that I said that, but it would be true for other things, as well, if one had reliable information about the exposures.

Q. In one had reliable information about education, about income, about diet, about other lifestyle factors, all of those could only enhance the confidence in the relative risk established, is that correct?

A. You mean if you adjusted for all these questions?

Q. Yes. It was a bad question. Let me -- just so we clear up the record.

A. Okay. Can we deal with alcohol and the other things separately because we did actually look at

http://legacy.library.ucsf.edu/tid/frq07a00/pdf
Source: https://www.industrydocuments.ucsf.edu/docs/msgl0001

alcohol?

Q. Well, you have already adjusted for alcohol because you believe it's important to adjust for alcohol, and --

A. Well, we looked at it and found it didn't make much difference, actually, rather than -- but anyway.

Q. That was on the British doctors study, is that correct?

A. No. We looked at alcohol in some smoking in unpublished analyses of the CPS II study, as well. It just didn't make very much difference.

Q. It makes a difference on laryngeal cancer, doesn't it?

A. Yeah. But for the main patterns, it's not going to make very much difference.

Q. Insofar as all-cause mortality is concerned; that is, insofar as death from all causes is concerned, if one had access to the degree to which smokers and nonsmokers characterized themselves by education, income and diet, adjustment for socioeconomic status and diet would yield a more accurate relative risk of the effects of smoking on all-cause mortality, would it not?

A. It might do. It might do. Whether it would

http://legacy.library.ucsf.edu/tid/frq07a00/pdf
Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

make any material difference is another question.

Q. Whether it would make a material difference could only be known after the actual calculations were made, is that correct?

A. Yes. The thing is, before adjusting for lots of things, you'd like to know how accurately these things in themselves -- these things in themselves are known, and for that you need repeat questionnaires, which, although they've been done, haven't yet been sort of consolidated properly and checked and analyzed.

Q. Now, Doctor, let's compare this database, the CPS II, with the Medicaid population of Mississippi.

Are you familiar at all with the Medicaid population of Mississippi?

A. I know something about Medicaid. At what ages is it relevant?

Q. All ages.

A. All ages.

Q. What percentage of the Medicaid population of Mississippi is black, is African American?

MR. PATRICK: Objection.

A. I'm sorry. I'm not going to be able to answer

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Document hosted at www.industrydocuments.ucsf.edu/docs/msgl0001

any such questions.

MR. PATRICK: Objection.

Q. Do you know what percentage of the State of Mississippi is African American?

A. No. I would imagine that it's of the order of half, something like that. I don't know.

Q. It has the highest percentage of African Americans in the United States, is that correct, to your knowledge?

A. I believe so --

MR. PATRICK: Objection.

A. -- but I don't know. I'm really not an expert on that.

Q. And by definition, the Medicaid population comes from the lowest income groups, is that correct?

A. I don't know what the system is here. I'm sorry.

Q. The Medicaid system here is a need-based system, an economically need-based system that provides medical care to people whose incomes are below a certain level. And by definition, the Medicaid population is from the lowest economic stratum of society.

A. There isn't any stratum that just gets

http://legacy.library.ucsf.edu/tid/frq07a00/pdf
Source: https://www.industrydocuments.ucsf.edu/docs/msgl0001

completely missed even by that, is there?

Q. Excuse me?

A. There isn't any stratum that gets completely missed, is there, so skid row, essentially? No?

Q. No. The Medicaid population; that is to say, the welfare population in Mississippi, is not a cohort that has very much in common with the British doctors cohort that you studied, is that correct?

MR. PATRICK: Objection.

Q. In terms of socioeconomics -- let's break this down.

In terms of education, the welfare population in Mississippi does not have very much in common with the British doctors who you studied, is that correct?

A. No. There will be differences, and one systematic difference between them is that they're American and that the British doctors are British. If you want systematic differences, I'm sure you'll many of them.

Q. And other systematic differences that you could identify between the Mississippi welfare population and the British doctors would include what?

A. Well, the British doctors study is some time in the past. Quite a lot of the deaths took place in

http://legacy.library.ucsf.edu/tid/frq07a00/pdf http://www.industrydocuments.ucsf.edu/docs/msgl0001

the '50s and the '60s in the British doctors study. I think they're talking about more recent mortality patterns in Medicaid.

Certainly the British doctors would differ from the State of Mississippi in general in average income or socioeconomic status anyway. If not income, you might find the poor in America have something comparable with people in Britain. But there are certainly differences between them, yes.

There would be systematic differences between them, and there would be systematic differences between the people in CPS II and the people in the State of Mississippi or, in particular, the Medicaid people in the State of Mississippi.

Q. But let's break some of them down.

First, for the British doctors, one systematic difference that you identified is income, and another is education. There would also be systematic differences in diet between the typical diet of a British physician who you studied and the typical diet of --

A. Yeah.

Q. -- welfare recipients in Mississippi, is that correct?

http://legacy.library.ucsf.edu/tid/frq07a00/pdf
Source: https://www.industrydocuments.ucsf.edu/docs/msgl0001

A. Yeah.

Q. There would be differences in work environment --

A. Yes.

Q. -- of the low-income people of Mississippi and British physicians, is that correct?

A. Yes.

Q. There would be differences in potential industrial exposures between British physicians and the Mississippi Medicaid population, is that correct?

A. Yes.

Q. There would be differences in fat intake between the British doctors and the Mississippi --

A. There might be. That I don't know. That I think we really don't know. There might or might not be. And if there were, it could go either way.

Q. And there are potential differences in alcohol intake between British physicians and the Mississippi welfare population, is that correct?

A. Again, I don't know. That, also, could go either way.

Q. There are potential differences in the use of what in the United States are illegal medications between British physicians and the Mississippi Medicaid

http://legacy.library.ucsf.edu/tid/frq07a00/pdf
Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

population, is that correct?

A. I don't know. I presume so, but that is purely by anecdote, so --

Q. There are differences in level and availability of medical services to British physicians and to the welfare population of Mississippi?

A. Yes.

Q. There are differences in rates of infectious diseases between the medical -- the doctors in the British physicians survey that you studied and the welfare population of Mississippi, is that correct?

A. Yes.

Q. And all of these differences that we've identified between the British physicians and the Mississippi welfare population would also bear true in comparing the CPS II cohort and the Mississippi welfare population, is that correct?

A. I would imagine so. I mean that's why we tried concentrating on the relative risks, and it's the use of the relative risks, except -- with the exception of the lung cancer in the nonsmokers.

Q. Doctor --

MR. GROSSMAN: We'll just take another one-minute break.

http://legacy.library.ucsf.edu/tid/frq07a00/pdf http://www.industrydocuments.ucsf.edu/docs/msgl0001

THE VIDEOGRAPHER: The time is 12 minutes after 12:00. We're going off the record. This is the end of Tape No. 1.

(Recess at 12:00 p.m.)

(Resumes at 12:23 p.m.)

THE VIDEOGRAPHER: 12:23, back on the record with Tape No. 2.

Q. Doctor, one of the other factors that may distinguish British doctors from the Mississippi welfare population is leisure exercise, is that correct?

A. Yes, if --

Q. And that would also distinguish the ACS II -- CPS II population from Mississippi welfare workers -- or welfare --

A. Actually, I'll take that back. I assume we don't know whether there would be any systematic difference in leisure exercise --

Q. Okay.

A. -- or not between British doctors and people in Mississippi.

Q. One thing that might distinguish the British physicians from welfare recipients in Mississippi would be leisure exercise, is that correct?

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

A. It might. You know, I certainly couldn't exclude that. I don't know anything about the leisure exercise of either of them.

Q. Okay. And similarly, one factor that might distinguish Mississippi welfare recipients and CPS II cohort members would be leisure exercise, is that correct?

A. It might. Again, I've got no information really.

Q. And yet again, one factor that could be reviewed on the basis of the CPS II database that might distinguish smokers from nonsmokers is leisure exercise, is that correct?

A. Yes. I don't know what questions we have about exercise here.

Q. There is a question, No. 1 on Page 2, that asks, "How much exercise do you get (work or play)? None, slight, moderate or heavy," self-evaluation.

A. Yes.

Q. And the CPS II database could be used to determine the extent to which smokers and nonsmokers differ in their self-evaluation of exercise, is that correct?

A. Yes.

http://legacy.library.ucsf.edu/tid/frq07a00/pdf
Source: https://www.industrydocuments.ucsf.edu/docs/msgl0001

Q. Now, Doctor, let's look initially at the -- at that factor of exercise, self-reports of exercise, and all-cause mortality.

You said earlier that you know of Lawrence Garfinkel as being one who had responsibility for the nosology of the CPS II cohort?

A. Nosology?

Q. Yes.

A. Nosology is the classification of causes death or --

Q. Let me start the question again, break it down.

You said earlier that you know of Lawrence Garfinkel and Steven Stellman as being responsible for --

A. For setting it up.

Q. -- setting up the CPS II study?

A. Among those who were importantly involved. I don't know of anybody else who was more importantly involved than them.

MR. GROSSMAN: All right. Let's mark this as 18.

(Article marked Exhibit No. 18 for identification.)

Q. Professor Peto, let me hand you what has

http://legacy.library.ucsf.edu/tid/frq07a00/pdf www.industrydocuments.ucsf.edu/docs/msgl0001

been marked for identification purposes as Peto Deposition Exhibit No. 18, which is an article by Lawrence Garfinkel and Steven Stellman entitled, "Mortality by Relative Weight and Exercise."

Doctor, first of all, that article is published in a journal called, "Cancer." Are you familiar with "Cancer"?

A. Yes.

Q. And that is the official journal of the American Cancer Society?

A. I believe so. Anyway, it's a reputable journal.

Q. And this article refers to mortality in relation to relative weight and exercise analyzed from data collected in the first two years of the CPS II study?

A. Yes.

Q. And at that time Mr. Garfinkel and Mr. Stellman were responsible for the CPS II study?

A. I believe they still were responsible for it at that time, yes.

Q. Now, I'd like to direct your attention to Page -- I'll find it -- Page 14 -- 1848, Figure 4.

A. Yes.

http://legacy.library.ucsf.edu/tid/frq07a00/pdf
Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

Q. That is a graph that charts standardized mortality ratios by exercise for all causes of death for current smokers and nonsmokers by sex, correct?

A. That's what it's labeled, yes.

Q. What is a standardized mortality ratio?

A. Could I just find out, does this exclude those who were already sick? Is this an analysis among those who did not report themselves to be already sick, or does it -- I mean some of the earlier figures are subdivided according to whether people are already sick. I'm not sure whether this is.

Q. Well, why don't you take a moment to review that.

A. Sick persons were not analyzed, it says in the discussion, so presumably that relates to the Figure 4. What I can't find is the numbers.

Q. Are you ready?

A. I am ready. What I can't find out is how many -- roughly how many deaths there are in each category. It doesn't seem to give this information anywhere.

Q. All right. Mr. Peto, according to Mr. Garfinkel and Mr. Stellman, who were responsible for the CPS II database at the time, nonsmokers who

http://legacy.library.ucsf.edu/tid/frq07a00/pdf http://www.industrydocuments.ucsf.edu/docs/msgl0001

didn't exercise had a higher standardized death rate than smokers who exercised moderately or heavily, is that correct?

A. According to this figure, that's correct. See, my concern is that those who took no exercise, despite the effort to exclude those who were sick already, that those who took no exercise may have taken no exercise because they had some sort of physical condition that wasn't recorded. I mean, remember, these people are, of necessity, less than two years away from death.

Q. You're suggesting that there may be some bias in these numbers, but you don't know, is that correct?

A. I think there's likely to be some appreciable bias. We're talking about people who are less than two years away from death, and when you are less than two years away from death, whatever it is that's going to kill you may actually affect your enthusiasm for exercise or ability to exercise.

Q. Mr. Peto, earlier you said that there was a likely bias in the CPS II database, that people who were two years away from death, or who believed themselves to be mortally ill at the time that the survey was initially conducted, would not have signed

http://legacy.library.ucsf.edu/tid/frq07a00/pdf
Source: https://www.industrydocuments.ucsf.edu/docs/msgl0001

on as members of the database?

A. They might be less likely to sign on, and if they did sign on, they might be less likely to exercise. That's why I wanted to know how many people we're talking about here.

Q. All right. If people who believed themselves to be mortally ill at the commencement of the study in general did not sign on to the study, then it would not be a significant bias in the study with regard to exercise?

A. Well, two thirds of the deaths in the first two years of this study were all people who already said they were -- that they were sick, who already described themselves as being sick when recruited.

So of the remaining one third, there must have been some more who, you know, were sick in various ways but didn't actually report themselves as being so.

So you -- I mean, of the deaths in the first couple of years in this study, two thirds were among people who said that they were already sick. It was about two thirds. I don't know exactly, but that's about what it was.

Q. At least insofar as the reported numbers in the "Cancer" article are concerned, it is quite clear,

http://legacy.library.ucsf.edu/tid/frq07a00/pdf
Source: https://www.industrydocuments.ucsf.edu/docs/msgl0001

is it not, that smokers who took moderate or heavy exercise had greater life expectancy than nonsmokers who did not exercise at all?

A. This could be like the thing saying, you know, what's the most dangerous place in the world to be, and the answer is bed. Look at the number of people who die in bed.

You know, if it is disease that is discouraging exercise, then that wouldn't be an appropriate way of describing things. I mean, you know, then you'd just be saying those who are dying have a poor life expectancy.

Q. You're suggesting that there may be confounders, you're not sure one way or the other?

A. You'd do better to look later on in the study if you're going to do this, it would be better to look at later years. The first two years are the years where this problem is going to be maximal.

Q. Well, let me hand you --

MR. GROSSMAN: Is this a copy that we can use?

MR. BURNS: No. I mean it's blank.

MR. GROSSMAN: We don't have another copy. Let's mark this.

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

(Transcript marked Exhibit No. 19 for identification.)

THE WITNESS: What is this?

MR. GROSSMAN: It's a transcript of Larry Garfinkel.

Q. Mr. Peto, let me hand you what has been marked for identification purposes as Peto Exhibit No. 19, which is a transcript from the case of Gilboy versus the American Tobacco Company, the continued Deposition of Lawrence Garfinkel taken on April 10th, 1996. So it's a deposition of Mr. Garfinkel taken this year.

A. Yeah.

Q. And I'd like to direct your attention to Page 404 --

A. To Page --

Q. 404. -- where Mr. Garfinkel was asked whether his findings were that smokers -- his -- let me start that again.

I'd like to direct your attention to Page 404, where Mr. Garfinkel was asked, with regard to the CPS II database, if he did not find that smokers who exercised had a greater life expectancy than nonsmokers who did not exercise.

MR. PATRICK: I'm going to object to the form of

http://legacy.library.ucsf.edu/tid/frq07a00/pdf https://www.industrydocuments.ucsf.edu/docs/msgl0001

the question and the use of the deposition, but he can answer.

Q. And it was his testimony in 1996, was it not, as the person who had been responsible for the CPS II database, that nonsmokers who failed to exercise had a greater risk of overall mortality than smokers who exercised moderately or heavily?

A. I think if you wanted to answer that, you'd do much better to look not in the first two years of such a study. The further away from the early period you get, the more reliable it would be.

And also, I don't know whether those who say they take zero exercise are a small group or a large group.

Q. Okay. I want to break your answer down in to a couple of parts. I think I understand what you're saying, but I want to break it down.

First, you think that if one were to look at the CPS II database in later years, one might get a more accurate assessment of the effect of exercise on longevity, is that correct?

A. Yes, probably. I think you'd be -- it would be preferable to look further out.

Q. Secondly, you believe that if one were to look at the later years of the CPS II study, one could make

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

a more accurate comparison between the risks of a sedentary lifestyle and the risks of smoking, is that correct?

A. I think it would be likely to be more reliable, but --

Q. Third --

A. -- I think I would need to work -- I think I'd like to object in one sense that I think that I'd really need to work with this aspect of the data to really gain a proper understanding of it, and I haven't actually done that.

Q. Okay.

A. So I don't really think that my comments on this will turn out to be very helpful.

Q. Third, your caveat being understood, you have no basis upon which to disagree with what Lawrence Garfinkel and Steven Stellman, as the persons responsible for the CPS II study, reported with regard to the results of the CPS II study, is that correct?

A. They have reported it, that's a matter of fact. What I think of the analysis, I'd need to spend more time investigating what was done and also what happens in the later years and particularly what the numbers are in this category who describe themselves as

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

taking no exercise at all. I mean none at all means what?

Q. Fourth, are you familiar with the Harvard Alumni Health Study?

A. I know of it, I've heard of it, as much by reputation as by other things.

Q. It is a study not unlike the study you conducted among British physicians; that is, it's a cohort study, is that correct?

A. I believe so. They -- I can't remember the exact period of it, though, the numbers it covers.

MR. GROSSMAN: Let's mark this.

(Article marked Exhibit No. 20 for identification.)

Q. Mr. Peto, let me hand you what has been marked for identification purposes as Peto Deposition Exhibit No. 20, which is a reprint of a JAMA article of April 19, 1995, entitled, "Exercise Intensity and Longevity in Men, The Harvard Alumni Health Study."

Doctor, that was a prospective cohort study, is that correct?

A. Yes. If you're going to look at how long the follow-up is, 1988. Okay.

Q. Now, in that study, the subjects were Harvard

http://legacy.library.ucsf.edu/tid/frq07a00/pdf
Document hosted at www.industrydocuments.ucsf.edu/docs/msgl0001

alumni with -- who had not been diagnosed by any physician with cardiovascular disease, cancer or emphysema at the time the study began, is that correct?

A. Yeah. Sorry.

Q. Gesundheit.

A. Okay. Sorry. I got diverted by sneezing. Could you repeat the question?

Q. That's all right. Yes.

The study involves Harvard alumni who, at the time the study began, had not been diagnosed with any cancer, cardiovascular disease or emphysema, is that correct?

A. Yes.

Q. And the study followed the members of that cohort for a number of years to determine the effects that various lifestyle behaviors had on all-cause mortality?

A. Yes.

Q. Now, I'd like to direct your attention, if I may, to Page 1182, in the section entitled, "Comment."

Do you see that they found, based upon their study, that vigorous exercise was positively associated with decreased mortality, which is to say that people

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

who exercised vigorously had -- were less likely to die young?

A. Yes.

Q. And it found that the difference in the risk of dying from failing to exercise was about the same as between alumni who were 20% or more overweight, versus those who were of ideal weight, or between alumni who smoked one pack of cigarettes a day or less and nonsmokers.

A. That's what they report.

Q. Okay. So within that cohort, they found that being 20% or more overweight, failing to exercise and smoking up to one pack of cigarettes a day were all independently of the same relative risk for all-cause early mortality, is that correct?

A. That is what they report.

Q. All right.

A. I think if you want to sort out cause and effect, it's preferable not to look at all-cause mortality because then the differences are not as extreme.

You know, if you take a 20-fold relative risk for something like lung cancer and you bury it in all-cause mortality, then the differences cease to be as extreme,

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

and it becomes more difficult to establish cause and effect clearly.

Q. But in looking at the question of all-cause mortality, the Harvard study found, and other studies, too, have found, have they not, that obesity, failure to exercise and smoking all present approximately the same relative risks with regard to all-cause mortality?

MR. PATRICK: I'm going to object to the form of the question.

A. I think, have -- your question is, have any studies found this, or would a systematic review with relevant evidence find this? And these are very different questions.

And it's not clear to me that exercise is anywhere near as relevant as cigarette smoking to all-cause mortality because there are many ways in which, you know, disease can itself correlate with exercise, and this is a problem in some studies.

I can't remember this study. I think they somehow finished up missing -- I can't remember what they did in this. They classified them as to whether it was vigorous, something like -- there's some way in which a lot of the deaths disappeared, as I remember it, and

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

there was some -- I'll just take a quick look at where the deaths go to.

They have a total of 3,728 deaths, and then men who reported only vigorous activities, 259 deaths, and then men who reported only nonvigorous activities, 380 deaths, so somehow there's 3,000 deaths disappeared in between these ones, so I'm a bit worried as to what exactly is going on here.

Q. Doctor, without extensively studying the Harvard Alumni Study, "Cancer" is a reputable journal, is it not?

A. This is in JAMA. This is in JAMA, not "Cancer."

Q. I'm sorry. JAMA is a reputable peer-review journal, is that correct?

A. Yes.

Q. And any article --

A. If you think that that guarantees the correctness of what's published there, then really you are much mistaken.

Q. Not because it's JAMA, but because you don't trust --

A. Oh, no. Because there is no such thing as a journal in which everything can be trusted.

http://legacy.library.ucsf.edu/tid/frq07a00/pdf
Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

Q. Doctor, why don't we move on to the next area.

A. Well, I'd like to find out what it is they're doing, where did these various deaths disappear to, because they seem to start off with 3,700 deaths, and then they have 259 in the only vigorous, 380 in the only nonrigorous, and so something like 3,000 deaths seem to have vanished from their analysis, which -- okay.

Okay. So here they've -- they have conducted additional analysis, they've omitted the first five years, which they say is arbitrarily chosen, of follow-up.

Q. And that would be to discount for those who were ill at the time -- at the time when the study commenced?

A. Yes. You don't want --

Q. That's exactly what you suggested should be done?

A. Yes, which is perhaps why they observed something much less steep than is observed in the other paper, where the other paper is restricted to the first two years, which is where the problems would be greatest.

http://legacy.library.ucsf.edu/tid/frq07a00/pdf http://www.industrydocuments.ucsf.edu/docs/msgl0001

I mean I think, you know, that's the sort of obvious thing to do is to miss out on the first few years. These people have done it, and the other one didn't do it because in fact the other one had only two years of follow-ups. They couldn't.

Q. Having eliminated the first five years for people who were ill but not diagnosed with illness at the beginning of the study, they still find that lack of exercise and smoking a pack of cigarettes a day present the same relative risk for premature death, is that correct?

A. That doesn't seem to be what this table says. If you take Table 2, the top part of Table 2, "Energy expended on all activities," and then -- you know, which is a measure of exercise -- and the gradation there is from about 103 down to about 90, and you've got a reasonably large category at the bottom with 589 deaths in it and a reasonably large category at the top, the top two categories with 700 and 850 deaths.

And in those ones with reasonably large categories, it seems to go from 103 down to 90, but I mean the ratio of death rates from smokers to nonsmokers is much more extreme than that.

I mean in the CPS II study, it's more like 3 to

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

1. This is .9 to 1, so that doesn't seem to be a correct statement because --

Q. They said that the difference between vigorous activity and lack of exercise was the equivalent of the difference between smoking a pack of cigarettes per day up, up to a pack of cigarettes per day, and not smoking, is that correct?

A. Well, it isn't, according to Table 2. That's not what Table 2 suggests.

Q. Table 2 shows --

A. Well, the top of Table 2 shows, if you just take the energy expended on exercise or on vigorous exercise, the middle part of it is vigorous exercise only, and the trouble is that you start running out of numbers because a lot of these are based on really very small numbers of deaths.

I mean the top -- you know, the top group, 2100, is 22,700 deaths, and then all these other ones are much smaller numbers. I mean if you just took, you know, the one third who have the most exercise, that would be a sort of average of what you see over in the right-hand column there.

And if you take total exercise, which is the top part of Table 2, then the numbers are 103 in the top

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

line and 90 in the bottom line, 103.70 and 90.70, so it's a ratio of .9 to 1, whereas, for smoking versus nonsmoking in the CPS II data, there's -- in middle age, it's ratio of about 3 to 1, or 1 to .3, if you like, so smoking is much more extreme than is suggested by this particular analysis.

Q. Within this particular cohort --

A. Where's the smokers versus nonsmokers in this cohort?

Q. They -- if you look at, "Comment," on Page 1182, there have been a number of publications on this cohort, have there not, Mr. Peto?

A. Yeah.

Q. Okay. This particular publication deals with exercise intensity and longevity, is that correct?

A. Yeah.

Q. And the Harvard study has published other pieces on smoking and longevity, is that correct?

A. I've certainly seen him lecture -- Paffenbarger lecturing on this. I haven't --

Q. And Paffenbarger is a reputable epidemiologist, is he not?

A. Yes, although, again, being a reputable epidemiologist doesn't guarantee the correctness of

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Available at http://www.industrydocuments.ucsf.edu/docs/msgl0001

what is written.

Q. All right. In the "Comments" section, it says, "The difference in mortality risk of approximately the same magnitude as that between alumni study, 20% or more overweight and those of ideal weight, or between alumni who smoke one pack of cigarettes or less daily and nonsmokers."

You have no basis upon which to disagree with that, is that correct?

A. It's certainly out of line with other studies of the effects of smoking, if that's what they really found. I mean one possibility, which I may suspect may well be the case, in America, the educated, of which half of the alumni would certainly be one -- would be a group, have really cut down a lot on their smoking.

So if what they did was just ask them what they smoked in the 1960s and then followed them up to the late '80s, then by the time you get to the late '80s, most of them would have quit. You know, the rich in this country have really, you know, quit smoking in large numbers, Harvard Alumni, people like that have quit, and so it may be that, if that is true of this survey, then it's because they asked them only once what they smoked, and in this group, most of the

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

smokers didn't keep on smoking, therefore, didn't get the death rates, so --

Q. But that would be speculation as to whether in fact that was the cause of --

A. Well, no. I mean if they described the structure of the study, if you asked them -- you know, asked them what they did back in the '60s and then followed them up in to the '80s.

Q. But they continued to ask them through the '80s on exercise and smoking and other conduct, did they not?

A. This seems to describe a study in which they ask once only and then follow up from then on, and that's what they describe. So they're followed to more than 20 years, so I mean the smokers wouldn't have continued smoking, and you'd -- I mean there's been a very big change of smoking habits in the sort of educated, you know, in sort of graduates in this country.

Q. Are you familiar with the Harvard questionnaire, the Harvard Alumni Study questionnaire?

A. No.

Q. Are you familiar with the number of times that the questionnaire was mailed to respondents in the

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: https://www.industrydocuments.ucsf.edu/docs/msgl0001

cohort?

A. I think it's the one-off thing, but -- based on my memory. I edited a book, Paffenbarger wrote a chapter drawing on, among other things, this study. And I think it's that they just asked once, at least that's what they describe doing here, just asking once. If you look at the top of Page 1180, I think it describes just asking once and following.

Q. That's certainly something that could be checked, is it not, whether they -- whether it was a one-off questionnaire or whether additional questionnaires followed?

A. I think it's pretty clear from the methods section here that it's a one-off.

Q. And that is something that could be --

A. It's something that could be made explicit, but I'm pretty sure from this that it's going to be one-off, as far as this is concerned.

Q. And it is something that could be confirmed, is that right? It's a simple fact that could be confirmed --

A. Yeah.

Q. -- whether in fact it was a one-off or whether there were additional questionnaires that were sent

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

out?

A. Yes, but also whether or not what's said about smoking relates to smoking, as described once in the 1960s. And the thing is, look, smoking has much bigger relative risks than that. I mean the difference between smokers and nonsmokers is a lot bigger than say .1 to .9.

Q. The difference between -- I'll start that again.

The difference in all-cause mortality between smokers and nonsmokers varies with social class, as well, doesn't it?

A. The difference between them varies with social class? I'm not sure it does, does it? I mean not if you -- not if you take people who've really continued to smoke.

I mean in the British doctors, for example, we found a ratio of about 3 to 1 in middle age, less in old age, but in the CPS II study they found a ratio of about 3 to 1 middle age but less in old age.

Q. But in the CPS II study, it would be possible to control for socioeconomic status, would it not?

A. Yes.

Q. And if one controlled for socioeconomic

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

status, one might find that the all-cause mortality ratio from smoking varied with social class, correct?

A. One might find it. Whether it would vary to any significant extent, I don't know. I don't see any reason to suppose that it would vary very greatly.

Q. But it's something, again, that one could check, is that correct?

A. Yes, but this is -- this statement, as Paffenbarger writes it, is not correct. It is not true that the difference between those who exercise and those who don't is comparable with the difference between smokers and nonsmokers.

Q. All right. Leaving aside the question of the exact relative risk for all-cause mortality from sedentary lifestyle or the exact all-cause mortality from excessive weight, you have acknowledged that both a sedentary lifestyle and obesity, as well as certain other factors, are risk factors for a greater risk of death at an early age, is that correct?

A. Yes, that's -- well, obesity, depending on where you start from. I mean it's a U-shaped relationship.

Q. And similarly --

A. But that's -- I mean part of the effect of

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

that U-shape relationship may itself be, you know, caused by cigarette smoking, that those who have low body weight might be smokers, and you might have them, so it could be that some of their high mortality is explained by that.

So again, you've got something which is not an enormously strong predictor and then another thing that is, and you want the thing that's really not terribly important, instead of asking the thing that's very important.

Q. Smokers tend to weigh less than nonsmokers, is that correct?

A. In the studies I've seen, they do, yes. And if you allow for that, then the effects of smoking would appear slightly greater.

Q. But among people who are obese, the effect of smoking -- let me start that question again.

Smoking is not likely to be a confounder for premature death due to obesity?

A. Due to. Again, it would be tautologically. Yes, it could be.

Q. Okay. Let me rephrase the question.

A. It could be. It could be.

Q. Let me rephrase the question. You're right,

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

the question could be tautological.

Smoking is not likely to be a confounder for deaths that appear to be due to obesity?

A. I don't know whether, when you get to the very obese, whether they're more likely to be smokers or not. Even though smokers have a lower body weight on average, you know, I don't know what the very obese do.

Anyway, I think -- a comment on these two papers, that this one, the Harvard one, I think is just an one-off questionnaire. I mean I don't suppose their questions about exercise are still true 20 years later. I mean what you do in the '60s and what you do in the '80s for exercise may well be importantly different.

And so it may be that it's underestimating the effect of exercise. Maybe the effect of exercise is greater than this suggests, but this doesn't suggest a very great effect of exercise.

If this suggests only a small effect of smoking, then a possible explanation might be that most of the smokers didn't keep on smoking, which I think would be true of Harvard alumni.

So this -- and the Garfinkel and Stellman one

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

being based on the first two years of the study I think is really quite unsatisfactory as a source of evidence of the effects of exercise, especially since they don't give the numbers in the different groups. I can't see anywhere here where they actually give the numbers.

MR. GROSSMAN: Let's mark this.

A. So I don't think in either case they'd justify the claim that exercise is as important as smoking as a determinant of risk of death.

MR. GROSSMAN: Let's mark this 21.

(Chart marked Exhibit No. 21 for identification.)

Q. Doctor, you've said earlier that smokers on the whole tend to weigh less than nonsmokers, correct?

A. I believe so. In most of the surveys I've seen, they have anyway. There might be populations in which that's not true.

Q. And most studies have shown that, when smokers stop smoking, they gain a little weight, is that correct?

A. The studies I've seen have suggested that, yes.

Q. Nonetheless, there are some smokers who are obese?

http://legacy.library.ucsf.edu/tid/frc07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

A. Yes.

Q. And obesity itself is a risk factor for premature death?

A. If we're really talking about substantial -- being substantially overweight, yeah if that's the way you mean obesity, yes, this is a risk factor of premature death.

Q. And if, notwithstanding the fact that smokers tend to weigh less than nonsmokers, a greater percentage of the truly obese also smoked --

A. If that were true, that would be possible. I don't know whether it is or not.

Q. If that were true, then obesity could be a confounder for premature death attributed to smoking, is that correct?

A. Yes, though it's more likely to be a confounder the other way in that, if you adjusted for body weight differences, then you'd actually see a greater hazard from smoking, it would be like alcohol.

Q. But in fact if a larger percentage of smokers than nonsmokers were truly obese, obesity could be a confounder for premature deaths attributed to smoking?

A. As also would be the case in the opposite direction for leanness. So it's -- you can have -- you

http://legacy.library.ucsf.edu/tid/frq07a00/pdf
Source: https://www.industrydocuments.ucsf.edu/docs/msgl0001

would have both effects if that were true, but overall smokers actually weigh less than nonsmokers.

Q. Okay. But if that were true, the answer would be yes, is that right?

A. If it were true, then severe obesity might be, if it were true, but I mean this is getting much too hypothetical, and at the opposite end, you'd have the opposite effect.

Q. And it would be possible, by a review of the CPS II database, which includes body weight, as well as smoking history, to determine whether a larger percentage of smokers than the rest of society were truly obese, would it not?

A. Yes.

Q. Now, Doctor, let me hand you what has been marked for identification purposes as Peto Exhibit No. 21, which is a copy of an official United States government publication regarding the percentage of adults who have regular and vigorous physical activity in 1994 broken down by states.

Directing your attention to that chart, Mississippi ranks 48th of the 49 states in the percentage of adults who have regular and vigorous physical activity?

http://legacy.library.ucsf.edu/tid/frq07a00/pdf http://www.industrydocuments.ucsf.edu/docs/msgl0001

A. I don't really know what the question -- what question they were asked, but --

Q. I believe they were asked --

A. -- whatever the question is, we're getting about 10% of those in Mississippi, as opposed to about 14% in the U.S. as a whole, so we've got 10% of those in Mississippi saying yes.

But if you included, say, the physical work that's associated with manual labor, then you know, maybe the differences wouldn't be very substantial, if there's more manual labor, for example, in Mississippi in, say, the rural activities.

Q. All right. Just so we have clarity here, the national median, as reported, for the percentage of adults who have regular and vigorous physical activity is about 50% higher than the report for Mississippi, is that correct?

A. Does this include work? Is this leisure activity, or is this work activity? What is this?

Q. I believe this is leisure activity.

A. Well, then surely you ought to be including as work activity, as well.

Q. Well, we'll come to that in a moment. I have a separate chart for that.

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

But with regard to regular and vigorous leisure activity, the national average is 50% higher than the average for Mississippi, is that correct?

A. It would less than 50%. It's about 14 -- well, according to this document, Exhibit 21, you've got 14% of the United States population and only 10% of the Mississippi population saying that they have regular and vigorous physical activity. I don't know whether this includes occupational activity or if it's just leisure activity.

Q. In fact there is a 47% difference between the two, is that correct? That is, 14.13% is approximately 47% higher than 9.76%?

A. Yes. It might be better to describe it as being a 4% difference between the two, though, in other words, 14% versus 10%.

MR. GROSSMAN: All right. This is a good moment to go off the record and to say that lunch has arrived.

THE VIDEOGRAPHER: 1:10, going off the record.

(Recess at 1:10 p.m.)

(Chart marked Exhibit No. 22 for identification.)

(Resumes at 2:10 p.m.)

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

THE VIDEOGRAPHER: 2:10, back on the record.

MR. GROSSMAN: Okay, thank you.

Q. Professor, let me hand you what's been marked for identification purposes as Peto Deposition Exhibit No. 22, which is a national government list showing the percentage of adults who live a sedentary lifestyle ranked by states. And that shows that 67% of people in Mississippi lead a sedentary lifestyle, which places it sixth on the list of states in terms of sedentary lifestyle.

Now, Doctor -- Professor, you said earlier that a sedentary lifestyle has been linked epidemiologically with premature death.

This would indicate, would it not, that the Mississippi population has an enhanced risk of premature death due to its failure to exercise?

A. Yes, I would think that would be. I don't know, but that if a sedentary lifestyle is linked with premature death, the trouble is it's also linked with high socioeconomic status, then that would tend to be the case.

It wouldn't affect the amount of -- it wouldn't affect the relative risk that is associated with smoking, though. I mean you'd take whatever background

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

you've got and then multiply it out by the effects of smoking.

Q. So insofar as overall mortality is concerned, if one were to control or adjust for sedentary lifestyle, one could more accurately assess the relative risk from smoking, is that correct?

A. No, there's no reason to believe the relative risk would be any different. All these high background risk factors mean is that, if people in Mississippi smoke, then the dangers are going to be particularly large.

Q. But if people in Mississippi who are smokers to a greater extent than nonsmokers live a sedentary lifestyle, then it would affect the relative risk, would it not?

A. And if the converse were true, it would affect it in the opposite direction.

Q. Yes, in either event. If a sedentary lifestyle were positively or negatively associated with smoking in Mississippi, then adjustment for a sedentary lifestyle would lead to a more accurate relative risk for overall mortality from smoking, is that correct?

A. The relative risk might be about the same,

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

yes, I mean if you were doing a study in Mississippi. But what we're doing is taking studies from outside Mississippi and using them to estimate what fraction of the deaths in Mississippi could be attributable to smoking.

Q. Well --

A. So these things aren't very relevant to that.

MR. GROSSMAN: Let me have this marked as Exhibit No. 23.

(Chart marked Exhibit No. 23 for identification.)

Q. Mr. Peto, let me hand you what's been marked for identification purposes as Peto Deposition Exhibit No. 23, which is a chart on death rate by homicide in the United States.

That chart shows, does it not, that Mississippi ranked second among the states in the United States in homicide rate?

A. Yes, 19 per 100,000.

Q. Which is almost twice the rate of the United States as a whole?

A. Yes.

Q. Now, there have been studies showing that smoking is statistically linked with homicide, is that

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

correct?

A. I'm not sure what the relationship is in the United States population.

Q. Well --

MR. GROSSMAN: Off the record.

(Discussion off the record.)

Q. Could you turn, Doctor, to Page A-11 in your book with Alan Lopez and others on mortality from smoking in developed countries.

A. Yes.

Q. If Table 3 of, "Smoking and Death in Middle Ages Among U.S. Males," you show that --

A. "Cirrhosis, suicide, homicide and accident, taken as a group, are more common among current cigarette smokers than among those who never smoked regularly."

Q. And in fact there have been a number of studies, including one published in the "Lancet," wasn't there, that showed that individuals who smoked were more likely to be killed by homicide than people who didn't smoke?

A. I don't know if there was one published in the "Lancet." It probably varies from culture to culture. I mean in China, for example, there's not much

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

difference between the smokers and the nonsmokers and the murder rate.

Q. But in the United States, the murder rate is higher among people who smoke, is that correct, even after controlling for --

A. I would imagine it would be, though it would presumably be due to confounding --

Q. Well, it's not biologically plausible that people who smoke are more likely to be murdered, is that correct?

A. No, the antismoking movement hasn't yet reached that point.

Q. Okay. We all appreciate that.

But Professor, the fact -- if one assumes for the moment that smokers are more likely to be killed by homicide, that there is a dose relationship between the amount they smoke and the likelihood that they will be murdered --

A. I'm not sure there's a dose relationship.

Q. If one assumes it, because there are studies that, without taking time to get them out, if one assumes that there is a dose relationship between the amount one smokes and one's likelihood to be murdered, that does not suggest that smoking is a cause of being

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

murdered, is that correct?

A. That's correct. And our comment that this is -- where you've got a moderate relative risk like this, then you are going to use evidence other than that relative risk to try to judge the plausibility of the association in trying to determine what's likely to be causal or not where you have a moderate difference. It's where you have the extreme differences that it's not necessary to appeal to other such evidence.

Q. So it's fair to say that the very high murder rate in Mississippi, almost twice the national average, is troubling but has nothing to do with smoking?

A. I would not expect it to have anything to do with smoking. And in our work, we've attributed none of the excessive homicide among smokers to, you know, to the effects of tobacco.

MR. GROSSMAN: This is 23, is it? 24.

(Chart marked Exhibit No. 24 for identification.)

Q. Professor Peto, let me hand you what's been marked for identification purposes as Peto Deposition Exhibit No. 24, which is a chart of death rate by injury in 1992 of the states of the United States.

A. This is injury excluding homicide or including

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Solutions from www.industrydocuments.ucsf.edu/docs/msgl0001

homicide?

Q. This includes homicide.

A. Okay.

Q. And at the bottom, it shows, "Injury here includes accidents, suicides, homicides, war and other not determined."

A. Yeah.

Q. One could subtract the rate of 19 for homicide from this rate to come up with the rest.

This shows that Mississippi has the highest rate of death by injury in the United States of almost twice the rate of the country as a whole?

A. Yes, about 90 per 100,000. Whereas, the average is 57 per 100,000. I don't know if it's twice, but it's --

Q. And again, this is -- this death rate, though troubling in itself, is unrelated to smoking?

A. I don't know whether smoking is related to suicide or not. I mean there is an association between smoking and suicide in a number of studies.

Q. A statistical association?

A. Yes, that's right.

Q. But that's most likely an artifact of some confounding factor such as personality, isn't it?

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

A. It's impossible to tell, as far as I can see. I don't know whether, you know, if you've got a fair chance of committing suicide and you become a smoker, whether it in some way affects. But you know, I've always put down none of the suicides to smoking, but I don't know whether that's true or not.

Q. Presuming that suicide is unrelated to smoking --

A. Yeah. One problem with a lot of these statistics, incidentally, which you keep putting over here is that these are just crude differences. If you -- for example, accidental death rates are much greater among young adults than among old adults.

So populations where you've got a greater proportion of young adults automatically are going to have higher rates of various causes of deaths like these. So I don't know what the age distribution is in Mississippi, but if the proportion of young adults is greater there than in other states, then you know, some of these differences are going to be confounders.

But anyway, it may not change the ranking very much, but it might, it might do. It would be preferable really to compare people of a given age with each other.

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

Q. Well, Professor, these are the available numbers, but --

A. Yeah. But that just takes the total number of suicides in relation to the total population or the total number of homicides. So it might be that if you concentrated on what's happening among, say, young adults in one place versus young adults in another place, then you might find the differences are not so extreme.

But it doesn't matter very much. I don't think that these listings are very relevant to assessing the extent to which smoking is killing people in Mississippi.

MR. GROSSMAN: Let's mark this as Deposition Exhibit No. 25.

(Chart marked Exhibit No. 25 for identification.)

Q. Mr. Peto, for clarity of the record, let me hand you what's been marked for identification purposes as Peto Deposition Exhibit No. 25, which is Page 33 of the most recent statistical abstract of the United States showing resident population by age and state in 1994 in the United States.

Giving that a review, Mr. Peto, the percentage of

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: https://www.industrydocuments.ucsf.edu/docs/msgl0001

youthful population in Mississippi is not out of the range of the norm for the United States as a whole, is that correct?

A. It would help if I could find Mississippi.

Q. It's listed with this -- east, south central, right there, MS.

A. Well, it's not greatly different. I mean you've got slightly higher than the average aged 18 to 24, yes.

Q. But very slightly?

A. Yeah, about 20% more. And you've got about average aged 85 and over, which where there's lot of accidental deaths. It's not enormously difference.

Q. The age distribution in Mississippi could not account for the differences in homicide rate, suicide rate, injury rate that these statistics show, is that correct?

A. It might account for some of it. It's not going to account for all of it.

Q. It won't account for most of it?

A. Not terribly important, agreed.

Q. Okay. Agreed that the age distribution is not terribly important?

A. It is not a terribly important determinant of

http://legacy.library.ucsf.edu/tid/frq07a00/pdf
Source: https://www.industrydocuments.ucsf.edu/docs/msgl0001

these interstate -- the differences between Mississippi and the U.S. national average.

MR. GROSSMAN: All right. Let's mark this as 26.

(Chart marked Exhibit No. 26 for identification.)

THE WITNESS: Good thing I've got a short name.

Q. Professor Peto, let me hand you what's been marked for identification purposes as Peto Deposition Exhibit No. 26, which is a chart, based on National Center for Health Statistics, of death rate by accidents and adverse effects in states of the United States. The accidents and adverse effects include motor vehicle deaths, poisonings, falls, drownings and other accidents.

Once again, Mississippi ranks first, is that right?

A. Yes.

Q. At close to twice the national average of death rate by accidents and adverse effects?

A. 59.5, as the other study, 5.1.

Q. Once again, this is a troubling rate in itself but not one that's related to smoking?

A. I suppose fire might be. I mean you've got -- but there won't be very many deaths from fire. It

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Document from www.industrydocuments.ucsf.edu/docs/msgl0001

would be a very small number, a very small part of this.

Q. Certainly drowning, poisonings, falls, none of those are related to smoking?

A. Not likely to be.

Q. Nor motor vehicle deaths?

A. I wouldn't have thought there would be much relationship, if any.

MR. GROSSMAN: 27.

(Chart marked Exhibit No. 27 for identification.)

Q. Mr. Peto, are you familiar with the criterion called Body Mass Index?

A. Yes.

Q. What is a Body Mass Index?

A. It's usually defined as the weight in kilograms divided by -- divided twice by the height in meters, per meter squared.

Q. And a male with a Body Mass Index of 27.8 or greater is obese?

A. I don't know of a formal definition of obesity.

Q. Let me hand you what has been marked for identification purposes as Peto Deposition Exhibit No.

http://legacy.library.ucsf.edu/tid/frq07a00/pdf
Source: https://www.industrydocuments.ucsf.edu/docs/msgl0001

27, which is a chart on a state basis from the Centers for Disease Control and Prevention of the Department of Health and Human Services of the percentage of adults by state who are overweight in 1994.

That, again, shows Mississippi to rank first among the states in overweight?

A. Yes.

Q. And you testified earlier that obesity is a risk factor for a number of diseases?

A. Yes.

Q. And the -- having a larger percentage of obese people in the population would increase the --

A. The hazards of smoking?

Q. Let me finish the question.

Having a larger percentage of individuals in the population who are obese would increase the overall mortality rate of the state?

A. Yes.

Q. All right.

A. It would also increase the dangers of smoking because you'd expect the dangers of smoking to multiply up on by background rates, so smoking would be particularly dangerous where you've got high background rates for those diseases that are caused by tobacco.

http://legacy.library.ucsf.edu/tid/frc07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

Q. That is for those people who are both obese and smoke?

A. Well, among obese people, smoking is going to be more dangerous than it is among lean people, other things being equal, and so -- because the absolute risk will be greater even if the relative risk is similar.

Q. All other things being equal, though, obesity increases one's risk of premature death, is that correct?

A. Yes, and increases the dangerousness of smoking.

Q. It also increases the dangerousness of leading a sedentary lifestyle?

A. Well, a sedentary lifestyle would also, if it's associated with a higher risk of vascular death, would increase the dangers of smoking because smoking's particularly dangerous for those who have high background rates.

So these things saying that Mississippi has high background rates would tend to indicated that smoking would be particularly dangerous for people with these lifestyles.

Q. And a sedentary lifestyle would be particularly dangerous for an overweight person?

http://legacy.library.ucsf.edu/tid/frq07a00/pdf
Source: https://www.industrydocuments.ucsf.edu/docs/msgl0001

A. I don't know the exact definition of sedentary lifestyle, and I don't know how that definition would translate in to risks. I mean, for example, if you take people who are, you know, upper class graduates and so on, well, on the whole they'd have lower death rates than the general population, and they'd have a sedentary lifestyle.

So you've got to be fairly careful how you define it. Smoking takes whatever your background risk is and then multiplies that up.

Q. Leaving aside the factor of smoking, if an individual were both obese and failed to exercise, his risk of early death would be increased beyond simply being obese or simply failing to exercise, is that correct?

A. Yes, though, as I said earlier, I'm still not entirely convinced that the evidence -- of how important exercise is, you know, what it is a surrogate for.

But to the extent to which there are any two risk factors, you know, obesity or inertia, then they're going to tend to multiply up the effects of the other, each would tend to multiply up the effects of the other.

http://legacy.library.ucsf.edu/tid/frq07a00/pdf
Source: https://www.industrydocuments.ucsf.edu/docs/msgl0001

Q. And for example, from the ACS II -- CPS II database, if such a database were available, one could determine the relative risk for premature mortality from a combination of being obese and from reporting no exercise, is that correct?

A. At least the self-reported evidence on exercise. I mean a lot of these things are actually very difficult to assess reliably, and if you tried asking all of us around the table here how much we exercise, you might have quite difficulty -- a lot of difficulty in really working out, except among people who have sort of very definite exercise patterns, who exercise a lot.

MR. GROSSMAN: Let's mark this as 28.

(Chart marked Exhibit No. 28 for identification.)

Q. Mr. Peto, let me hand you what's been marked for identification purposes as Peto Exhibit No. 28, which is a chart, again, from the Centers for Disease Control and Prevention of the Department of Health and Human Services, showing the percent of overweight adults who are trying to lose weight in 1994.

That shows that Mississippi ranks close to last in the percentage of adults trying to lose weight among

http://legacy.library.ucsf.edu/tid/frq07a00/pdf http://www.industrydocuments.ucsf.edu/docs/msgl0001

those who are overweight, is that correct?

A. It ranks 42nd, 33% of those in Mississippi, as opposed to 39% of those in the nation as a whole, say they were trying to do so.

Q. Now, if one combines the previous CDC chart showing that Mississippi led the nation in the percentage of obese individuals with the present chart showing that Mississippi ranks 42nd out of 49 states, 49 reporting states, in the percentage of overweight adults trying to lose weight, the combined effect suggests that the public health message of the value of maintaining an appropriate weight has not gotten out in Mississippi, is that correct?

A. I don't know whether the message has gotten out. I mean all I know are these statistics, that according to these statistics, you have a higher prevalence of overweight and, among those who are overweight, a lower prevalence of trying to lose weight.

Q. And that suggests either that people aren't heeding the public health message or, in the alternative, that the public health message is not getting out?

A. One or the other.

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

Q. Now, if the health message is getting out, if the health message is getting out but people aren't heeding it, it's no one's responsibility but those who aren't heeding it, right?

A. I don't know whose responsibility. This isn't really a statistical question. I don't really think I've got a useful answer to it.

Q. I'm sorry?

A. This isn't a statistical question. I don't think I've got a useful answer to it.

Q. Okay. Professor Peto, at the first session of your deposition, we discussed the potentially protective relationship of eating fruits and vegetables for lung cancer.

Eating fruits and vegetables is potentially protective for other diseases, as well, is that correct?

A. Yes.

Q. Including --

A. Whether it's the fruits and vegetables being protective or the avoidance of other things being protective is unclear, but particularly you'd finish up with lower cholesterol.

Q. Eating fruits and vegetables is inversely

http://legacy.library.ucsf.edu/tid/frq07a00/pdf https://www.industrydocuments.ucsf.edu/docs/msgl0001

related to heart disease, is that correct?

A. Insofar as it affects blood cholesterol, yes.

Q. And eating fruits and vegetables is inversely related to colon cancer, is that correct?

A. That's less clearly causal. There have been a number of studies suggesting that. It's very plausible, yes, probably it's correct.

Q. And eating fruits and vegetables is also potentially inversely related to other forms of cancer, is that correct?

A. Yes, again, with these caveats about uncertainties about whether it's causal or not.

(Chart marked Exhibit No. 29 for identification.)

A. Actually, coming back to your -- I'm sorry. Coming back to your previous question about whether health messages are getting through or not, both in Mississippi and in the United States as a whole, 10% of the population are overweight and trying to lose weight, and that's true both for Mississippi and for the U.S. as a whole. So it's 10% in both cases.

Q. But there is a far larger number of overweight people in Mississippi who are not trying to lose weight --

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

A. Yes.

Q. -- than in any other state in the country, is that correct?

A. Yes. I don't know whether it's than any other state, but it's certainly among the worst, I'll grant that, if these survey data are correct.

Q. Professor Peto, let me hand you what has been marked for identification purposes as Deposition Exhibit No. 29, which is a chart, again, from the Centers for Disease Control of the Department of Health and Human Services, this showing the percentage of adults who consume fruits and vegetables every day.

And on this chart, once again, Mississippi ranks last of the reporting states, is that correct?

A. Yes.

Q. In fact there is a significant difference between Mississippi and the next to last, is that correct?

A. Whether it's significant or not, I don't know. I don't know how big the survey was.

Q. The national rate for eating fruits and vegetables is 80% higher than the rate in Mississippi?

A. Well, it's 22% nationally, 14% in Mississippi, according to this survey. I don't know the quality of

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

the survey.

Q. If the survey is correct, it would indicate that the failure to eat fruits and vegetables is an additional risk factor in Mississippi that exceeds that of the United States as a whole, is that correct?

A. Could you repeat the question, please?

(Pending question read back by the reporter.)

A. Is it an additional risk factor in Mississippi, compared with the United States as a whole? If --

Q. And that's for all-cause mortality.

A. Yes, again, Mississippi has -- seems to have, according to these charts you're showing me, a lot of risk factors for all-cause mortality, and these will aggravate the hazards of tobacco by people in Mississippi.

Q. Leaving aside the question of tobacco hazards, all other things being equal, the failure of people in Mississippi to eat fruits and vegetables in relationship to the rest of the United States increases the risk of early death in Mississippi compared to the rest of the United States, is that correct?

A. If one takes the associations with fruit and vegetables as being causal, which I think they probably

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Document from www.industrydocuments.ucsf.edu/docs/msgl0001

are, then -- and if one takes the surveys as being accurate. I don't know the basis of the survey. Let's assume it's accurate.

If so, then it would increase their risk. But there's no reason to believe it would affect the relative risks associated with smoking.

(Chart marked Exhibit No. 30 for identification.)

Q. Mr. Peto, let me hand you what's been marked for identification purposes as Deposition Exhibit No. 30, which is a chart of the National Center for Health Statistics, showing death rate by tuberculosis in 1992 among the states in the United States.

Mississippi ranks second on that, is that correct?

A. That's correct.

Q. And its death rate by tuberculosis is almost twice that of the nation as a whole?

A. Yes. Both are remarkably low compared with what TB death rates used to be, but Mississippi is 1.34 per 100,000 per year, as opposed to .67 for the national average.

Q. And that, again, is a public health problem unrelated to cigarettes, is that correct?

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Document hosted at www.industrydocuments.ucsf.edu/docs/msgl0001

A. Well, not necessarily. I mean cigarettes do seem to aggravate death rates from TB, though I don't see why they should account for the differences between Mississippi and other states. But within Mississippi, the problem may be somewhat exacerbated by cigarette smoking.

Q. If the consumption of cigarettes in Mississippi is no more than that of the national average, then --

A. Then that wouldn't account for the difference between Mississippi and other states. But TB doesn't appear to be a health problem that is unrelated to smoking, so the differences between states would probably be unrelated to smoking, but within any particular state it may be the smokers who are most at risk.

Q. Let me make sure that I have your testimony accurately.

You're not suggesting that smoking causes tuberculosis, are you?

A. Well, that smoking might increase the death rate from tuberculosis.

Q. Just to clarify it, you're suggesting that, among people who suffer from tuberculosis, smokers may

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

have a higher rate of death, is that correct?

A. Well, whether it's increasing the likelihood of becoming infected in the first place or whether it's increasing the likelihood, among those infected, of going on and dying from the disease, I don't know.

But the observation is that smokers, you know, when there were TB deaths in western countries, that smokers had higher TB death rates than nonsmokers. And that was true in the British doctors study. And it's true nowadays in China, as well. It's not an enormous difference.

(Chart marked Exhibit No. 31 for identification.)

Q. Dr. Peto -- Professor Peto, let me hand you what's been marked for identification purposes as Peto Exhibit No. 31, which is, again, from the National Center for Health Certificate -- for Health Statistics. It is death rate by motor vehicle accidents in 1993.

Again, Mississippi ranks first on that list, is that correct --

A. That's correct.

Q. -- with a rate that's twice that of the nation as a whole?

http://legacy.library.ucsf.edu/tid/frq07a00/pdf http://www.industrydocuments.ucsf.edu/docs/msgl0001

A. That's correct.

Q. And that's unrelated to cigarettes, as you testified earlier?

A. I wouldn't expect cigarettes to be of any material relevance to that.

Q. It's fair to say from all of these statistics that Mississippi has substantial public health problems not without -- let me start this question again.

Doctor, without minimizing any effect that cigarette smoking may have on the risk of death in Mississippi or elsewhere, it's fair to say that all of these statistics dealing with motor vehicle accidents, other accidents, fruit and vegetable consumption, obesity, homicide and death by other causes suggests a substantial public health problem in Mississippi that's unrelated to smoking, doesn't it?

A. Yes.

Q. And there is something that the State ought to be able to do about that, isn't there?

A. I don't know. I don't know what the determinants are of these risks. I don't know what the avoidable determinants are and --

Q. One of the things that you've tried to do, as an epidemiologist, is to spread the word about the

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

risks of various health-related behaviors, haven't you?

A. Yes, principally tobacco and hepatitis B virus, but also cholesterol and blood pressure.

Q. And you believe that warning the public about the health risks of smoking or contracting hepatitis or of engaging in unhealthy health practices generally can have the effect of improving the health of the community because they're likely to follow some -- at least some of the warnings, is that correct?

A. It depends on the extent to which the warning gets acted on. I mean you try and give information, and then something or other has reduced smoking by about one third over the last 20 years, and I suppose the health warnings are some of it, and given the amount of advertising and promotion, it could just as well have gone up a by a third.

So yes, I think, taken as a whole, things that people have done on tobacco have reduced the number of people who choose to smoke.

Q. And one of the things that the State of Mississippi could do with regard to all of these other health-related activities that we've been discussing thus far is to warn its population of the risks,

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

couldn't it?

MR. PATRICK: I'm going to object to the form of the question. You can answer.

A. I don't know how effective various warnings are. I mean you can -- you know, you can talk about traffic accidents, you can talk about homicide, I mean you know, the states all do discourage homicide.

So I don't know what they could do. It's whatever is effective. If things are effective, one could do them, but it's very difficult to know the extent to which giving information actually changes behavior.

Q. Improving access to medical services would help, wouldn't it?

A. In what? In -- not in some of these --

Q. In terms of preventative care.

A. I don't really know enough about the circumstances in Mississippi to know whether there's especially, you know, difficult access to medical services there or not.

Q. Let me hand you what's been marked for identification --

MR. GROSSMAN: Oh, let's mark it first.

(Chart marked Exhibit No. 32 for identification.)

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

(Chart marked Exhibit No. 33 for identification.)

MR. GROSSMAN: I've placed two at the same time. It'll speed this up.

THE WITNESS: You couldn't mark the whole lot as one document, could you?

MR. GROSSMAN: No. I wish I could.

Q. Professor Peto, let me hand you what's been marked for identification purposes as Peto Deposition Exhibit No. 32, which is a chart from the U.S. Department of Health and Human Services, Health Care Financing Administration, on per capita health care expenditures in 1993.

And let me also hand you what has been marked for identification purposes as Peto Deposition Exhibit No. 33, which is also from the Health Care Financing Administration of the Department of Health and Human Services, and shows the percent of total personal health care expenditures spent on hospital care in 1993.

Now, Professor Peto, looking at the dollar expenditures contained on Exhibit No. 32, Mississippi ranks 47th among the states in the amount of money spent on personal health care, is that correct?

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

A. That's correct. The national average is $3,000. Mississippi spends $2,300. I don't know whether the services there are more or less expensive. There could be some element of local cost of living to adjust for.

Q. Looking at the table on Deposition Exhibit No. 33, Mississippi ranks fifth, does it not, in the percent of health care expenditures that are spent on hospital care?

A. Yes, that's right.

Q. Combining the information on chart -- on Exhibits 32 and 33, Mississippi spends less on nonhospital-based health care than any other state in the United States, is that correct?

A. It probably is. I can't -- I think -- I have to multiply all the things up. It's certainly one of the least on non -- it's one of the lowest spenders on nonhospital health care.

Q. And that implies, does it not, that people in Mississippi have less access to doctors on a regular basis?

A. I don't know. I just don't know what the circumstances are. It may well mean that.

Q. Now, Professor, what does it mean when a state

http://legacy.library.ucsf.edu/tid/frq07a00/pdf
Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

has a particularly high level of prostate cancer? What can that imply?

A. I don't know. Do you mean prostate cancer incidence or prostate cancer deaths?

Q. I mean incidence.

A. It probably means that it's got an unusually large black population because the rates tend to be higher among blacks, or it could mean that there's an unusually high level of looking for it.

Q. Is there -- and what would it imply if there were a particularly large death rate from prostate cancer?

A. Well, it could mean that the incidence rate is higher and -- you know, which this generally said that prostate cancer is more common among blacks and Mississippi has a higher proportion of blacks than other states.

The treatments, well, they're not very effective anyway, so it's probably not a lack of treatment.

Q. Now, smoking has nothing to do, so far as we know, with prostate cancer, is that correct?

A. Little or nothing. There have been one or two studies that have suggested an effect, but I don't find them particularly convincing. I mean some people have

http://legacy.library.ucsf.edu/tid/frq07a00/pdf http://www.industrydocuments.ucsf.edu/docs/msgl0001

argued that it does have an effect, but in general I think it has little or no effect.

MR. GROSSMAN: Let's mark this as 34.

(Chart marked Exhibit No. 34 for identification.)

Q. Professor Peto, let me hand you what's been marked for identification purposes as Peto Deposition Exhibit No. 34, which is a table compiled by the Centers for Disease Control and Prevention of the Department of Health and Human Services, showing the percentage of adults in each state who smoke, smoke cigarettes.

This shows that Mississippi is about average for the United States in the percentage of adults who smoke cigarettes, is that correct?

A. Yes. What the situation was, say, ten years ago or 20 years ago, I don't know, and you really do need to know that if you want to try and say the extent to which smoking is killing people, and you could make more accurate estimates anyway if you have this information.

Q. But from the information at your disposal, Mississippi's smoking rate --

A. Seems about average.

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: https://www.industrydocuments.ucsf.edu/docs/msgl0001

Q. It's about average?

A. It seems to be at present about average, so perhaps it's been about average in previous years.

MR. GROSSMAN: Let's mark this as 34? 35.

(Chart marked Exhibit No. 35 for identification.)

Q. Mr. Peto, let me hand you what has been marked for identification purposes as Peto Deposition Exhibit No. 35, which is a chart compiled by the National Center for Health Statistics of the Department of Health and Human Services, showing years lost by premature death in 1992.

This shows that Mississippi ranks first in years lost by premature death, is that correct --

A. Yes.

Q. -- with a premature death rate that's close to 50% higher than the national average?

A. Yes.

Q. And --

A. About 40% higher.

Q. And Professor Peto, taken in combination with the statistics that you've seen earlier relating to homicides, accidents, suicides and lifestyle patterns other than smoking, this shows that, in addition to any

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: https://www.industrydocuments.ucsf.edu/docs/msgl0001

problem that Mississippi shares with other states regarding premature death from smoking, Mississippi has very substantial additional problems, public health problems with premature death from other causes, is that correct?

A. Yes.

Q. In fact --

A. Some medical, some nonmedical.

Q. -- it has -- apart from any premature death related to smoking, it has greater problems with premature death as a result of other medical and nonmedical causes than any other state in the United States, is that correct?

A. If these figures are correct, which I suspect they are, then yes, that's correct. It's mixing medical and nonmedical causes, unfortunately, which makes it difficult to look at, you know, the sort of background on which smoking will be working.

MR. GROSSMAN: All right. Off the record.

THE VIDEOGRAPHER: 2:58, going off the record.

(Recess at 2:58 p.m.)

(Resumes at 3:10 p.m.)

THE VIDEOGRAPHER: 3:10, back on the record.

MR. GROSSMAN: Thank you.

http://legacy.library.ucsf.edu/tid/frq07a00/pdf
Source: https://www.industrydocuments.ucsf.edu/docs/msgl0001

Q. Professor Peto, just to sum up this area on Mississippi health statistics, it's fair to say, isn't it, that wholly apart from any problem related to cigarette smoking, the syphilis rate in Mississippi, the accidental death rate, the vehicular accident rate, the homicide rate and the various other rates relating to diet, obesity, exercise, show a public health care problem in Mississippi that's outside the mainstream of the United States?

A. It seems to be one of the worst states, from the statistics that you've shown to me, yes. And I would imagine there would be statistics on other things that would parallel that.

Q. And to an extent that it's really outside the mainstream of the country as a whole, is that correct?

A. Well, describe it how you like. I mean it's --

Q. Okay. Let's turn to your book, "Mortality From Smoking in Developed Countries, 1950 to 2000."

A. Okay.

Q. This book follows on a "Lancet" article that you and the other authors wrote together in 1992?

A. Yes.

Q. And this was all done at the behest of WHO?

http://legacy.library.ucsf.edu/tid/frq07a00/pdf
Downloaded from www.industrydocuments.ucsf.edu/docs/msgl0001

A. Of the World Health Organization.

Q. This is not an Abbott and Costello routine.

A. Okay.

Q. I know that --

A. It wasn't done exactly at the behest. They wanted -- the World Health Organization called a committee together to try to estimate the extent to which cigarettes were killing people in developed countries and in developing countries, and they asked me to chair that committee.

Out of that committee, this general approach evolved, and working as named authors but working in consultation with a group, we produced the "Lancet" paper, and then working on our own, not in consultation with a group, we produced the report.

The report was then circulated around various people within WHO for comment and revision. And it was then, you know, after suitable revision, was accepted as a joint World Health Organization and Bureau of Cancer Research Fund publication. Essentially they wanted to make sure that wasn't making unjustified claims.

Q. Professor, in this book, you and your colleagues created an indirect method for assessment of

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

national mortality rates from tobacco?

A. Yes.

Q. This was a novel method?

A. Yes.

Q. Did anyone ask you to devise a new method for assessing national mortality rates from tobacco?

A. Well, the charge of the committee was to try to make estimates of the extent to which smoking was killing people in different countries, and some of the existing methods didn't seem at all appropriate.

Q. Why weren't they appropriate?

A. They were taking fixed proportions of the deaths from particular causes, you know, such and such a fraction of the deaths from heart disease, and they would do that even in a country where people have started smoking so recently that these proportions were implausibly large.

You know, for example, if you take Spanish females, I would expect very few of the deaths from heart disease among Spanish females at present to be caused by smoking, and yet these methods were attributing substantial fractions of the Spanish female heart disease deaths from smoking. It didn't seem reasonable. We had to have some method at avoiding

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

things that seem absurd.

Q. In fact, the total lung cancer rate for Spanish females and Portuguese and French females, as well --

A. Yes.

Q. -- has been lower than the reported nonsmoking lung cancer rate for females in the United States in the ACS -- CPS II survey, is that correct?

A. It's approximately equal to. I don't think that -- there wasn't any material difference between them.

Q. At Page -- well, at the page entitled, "Summary," 1, "Summary: Purposes and Structure of the Monograph," you say that the chief aim of the book is to facilitate effective communication first to the reader and then by the reader of the size of the epidemic? It's at the bottom of the left-hand column.

A. Yes.

Q. And to that end, this book contains a waiver of copyright, is that correct?

A. Yeah, that's right. Everything except the "Lancet" article could be reproduced freely.

Q. There's a big copyright waiver right inside the front cover?

http://legacy.library.ucsf.edu/tid/frq07a00/pdf http://www.industrydocuments.ucsf.edu/docs/msgl0001

A. Yes, that's right.

Q. And it says, "Because this book is intended to help readers to communicate the evidence that it summarizes, many of the figures and tables are designed for use as visual aids, and any part of the book may be reproduced without seeking copyright permission from the publishers or authors"?

A. Yes.

Q. Now --

A. Except the "Lancet" article, yes.

Q. Now -- with the exception of the "Lancet" article as to which the "Lancet" owns the copyright, is that correct?

A. Yes, not that they're going to bother about it.

Q. So the purpose of this work was to promote public health?

A. It's partly to help people to understand it but chiefly to try to help them to explain it, yes. And also, if you understand the effects of smoking, then it makes it easier to think properly about the effects of other things, as well.

Q. Other things, such as what?

A. Well, if you want to understand the factors

http://legacy.library.ucsf.edu/tid/frq07a00/pdf
Source: https://www.industrydocuments.ucsf.edu/docs/msgl0001

other than smoking, you know, blood pressure, blood cholesterol, various things like this, then you need to get the effects of smoking straight.

Q. Now --

A. Also, particularly if we're talking about other causes of cancer, the fact that when you take out plausible estimates of the cancers caused by smoking, you don't have any underlying increases. This is of some interest in trying to think about strategies for cancer control.

Q. The purpose of this book was not to make a forensic determination of the percentage of responsibility that could be attributed to cigarette manufacturers, is that correct?

A. To cigarette manufacturers or to the use of cigarettes? I mean it's trying to say, you know, what fraction of the various deaths had cigarettes as a cause, but I mean certainly we were not thinking at all of tobacco litigation when writing it.

Q. And when you say as a cause, that is, as you said in the first session of your deposition, nonexclusive of other causes, as well, is that right?

A. That's correct. When I say that smoking is a cause of a particular death, I mean that, had the

http://legacy.library.ucsf.edu/tid/frq07a00/pdf
Source: https://www.industrydocuments.ucsf.edu/docs/msgl0001

person not smoked, then that death wouldn't have happened. There may be other things, as well, that had they not done, that death wouldn't have happened.

Q. When the Surgeon General of the United States compiles his annual list of the number of people who are -- whose deaths are attributed to smoking, he uses cause in the same way, as you understand it, is that correct?

A. Yes, I believe so.

Q. So that if one were to put together a chart of all of the people who died as a result of alcohol, all of the people who died as a result of lack of exercise, all of the people who died as a result of obesity, all of the people who died as a result of other dietary factors, all of the people who died as a result of smoking and all of the people who died as a result of various other things, one would reach a number of far in excess of the number -- total number of people who actually died?

A. If we had reliable knowledge, it may well be that one death has two causes, avoidance -- or more than two causes sometimes, avoidance of any of which would have avoided that death.

Q. And with heart disease --

http://legacy.library.ucsf.edu/tid/frq07a00/pdf
Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

A. But still, you've got about a third of all the deaths in middle age caused by smoking and wouldn't have happened had the people not smoked.

Q. With heart disease, which is the biggest cause of death in the United States --

A. Yes.

Q. -- there are many factors that are attributed as causes?

A. Yes.

Q. We went over several of them before?

A. Yes, there are several really definite causes. And the same would be true for cancer of the mouth, larynx or esophagus, that alcohol and smoking are both causes of most deaths, each of them is a cause of most deaths from cancer of the mouth, pharynx, larynx or esophagus.

Q. And so, as you use the term and as the United States Surgeon General uses the term, a person who dies of a heart attack could be said to have three or four or five causes of his death, is that correct?

A. I don't know if it would be as many as that because we don't have that kind of definitive information, but smoking is -- if somebody with high cholesterol dies from a heart attack, then you could

http://legacy.library.ucsf.edu/tid/frq07a00/pdf
Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

say, had their cholesterol been really low, then they probably wouldn't have died, had they -- no. I'm sorry.

If a smoker who has really high cholesterol dies of a heart attack, then you could say, had the cholesterol been really low, then that person probably wouldn't have died.

Likewise, if they had not smoked, you could say, if they hadn't smoked, then that person probably wouldn't have died of a heart attack. So you could say that that heart attack death could count towards both the number caused by cholesterol and the number caused by tobacco.

Q. And the same would be true with blood pressure and heart disease?

A. Yes, blood pressure particularly. When you get beyond smoking, blood pressure, blood cholesterol, then I'm very much less certain about the reliability of attribution of causality. Diabetes, but that's a rather minor, you know, a rather minor fraction of the population affected.

Q. And so, as you use the term and as the Surgeon General uses the term, a person who dies of heart attack who had high blood pressure, high cholesterol

http://legacy.library.ucsf.edu/tid/frq07a00/pdf https://www.industrydocuments.ucsf.edu/docs/msgl0001

and a smoking history, could be said to have died of all three causes?

A. It would be better to say that, if you took a thousand people who died, let's say, people in their 40s, if you take men in their 40s, take a thousand men in their 40s with high blood pressure, high cholesterol and who smoke and who died from a heart attack in their 40s, then could you say maybe 800 of those thousand deaths were caused by smoking, you might say that 800 of those thousand deaths, had the person had, you know, really low cholesterol, wouldn't have happened, and you might say that 800 of those thousand deaths, had the person had really low blood pressure, wouldn't have happened.

That could well be the case for those deaths, but it's -- you can't really say it of an individual death, but you can say it when you're talking about large numbers of deaths.

Q. Okay. And so, if one were to do that, one would come to a sum of 2,400 deaths, where there -- where only a thousand people --

A. There were a thousand deaths, that's right. And you could say that 800 were caused by smoking, 800 were caused by cholesterol, 800 were caused by high

http://legacy.library.ucsf.edu/tid/frq07a00/pdf
Source: https://www.industrydocuments.ucsf.edu/docs/msgl0001

blood pressure, yes, that would be perfectly possible.

Q. And that's the way you would do it and also the way the United States Surgeon General would do it?

A. Yes, although one would concentrate on the tobacco-attributable deaths when talking about tobacco and on the cholesterol-attributable deaths when talking about cholesterol.

Q. And so your method is not intended to make any kind of assessment of relative fault among those three causes with regard to those 800 deaths that you were referring to, is that right? That is, if you were to take the thousand deaths -- let me rephrase the question.

A. Yeah.

Q. If you were to take the thousand deaths, your method is not trying to assess liability or fault among the cigarettes, versus the blood pressure, versus the --

A. Cholesterol.

Q. -- cholesterol, is that correct?

A. It wouldn't say that one was any more a cause than the other was. It's that, you know, had the people not smoked, then those deaths wouldn't have happened. Blood cholesterol and blood pressure are a

http://legacy.library.ucsf.edu/tid/frq07a00/pdf https://www.industrydocuments.ucsf.edu/docs/msgl0001

bit more multifactorial, that's the trouble, so that you're not -- you're talking about internal characteristics, rather than external causes there.

Q. And is it fair to say, also, that tobacco manufacturers are not the target of this book?

A. They're not the target. I mean the target is, you know, trying to encourage people to -- not to smoke.

Q. In all of the countries referred to in this book, is smoking -- is cigarette -- are cigarettes a legal product --

A. Yes.

Q. -- so far as you know?

A. Yes.

Q. And if they're a legal product, you're not making a moral determination as to whether it's appropriate to sell cigarettes?

A. No. I mean my private view is that it is appropriate for cigarettes to be available on sale, given the number of people who are demanding them because, you know, what I've seen of trying to ban drugs doesn't actually seem to me the most wonderful kind of legislation to impose, but that's not really relevant to the book.

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

Q. The purpose of the book is to promote public health by --

A. Indirectly leading people to choose differently.

Q. Enhancing public knowledge and, therefore, enhancing public health?

A. Yeah. I mean, also, you -- it's such an enormous thing, epidemic, that you actually just need to describe it.

Q. Let's turn to your methodology in the book. You describe the methodology in summary --

A. The best description of it is in the "Lancet" paper, I think.

Q. In the "Lancet" paper?

A. The more detailed stuff, yeah.

Q. And also, at Page A-19 to 20 in summary form of the book itself, is that correct?

A. A-19 to 20. Yes. So this is a brief summary of --

Q. Yes.

A. -- the methods that are set out in more detail in the "Lancet" paper.

Q. In very brief summary, you begin -- let me start that again.

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

In brief summary, this is an indirect method of estimation, is that correct?

A. Yes.

Q. And you begin by assuming that the rate of lung cancer among nonsmokers determined in CPS II can be generalized to all industrialized countries, is that correct?

A. Yes, approximately, that if people hadn't smoked, then something like those death rates would have obtained around all various industrialized countries of the world, and although studies haven't been done, I note that, you know, in countries where you wouldn't expect very many female deaths, such as France, Spain, Portugal, you get a pretty good match, and that in the British doctors, if we look at the nonsmoker death rates in the British doctors, then you get a pretty good match, as well. It predicts about the number of nonsmoker lung cancer deaths that we actually observed.

Q. And so you begin with that assumption, that the nonsmoker rate of lung cancer in CPS II can be generalized to all other countries, as a nonsmoker lung cancer rate?

A. That if they hadn't smoked, then the nonsmoker

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

lung cancer rate would be something like that, yes, not necessarily exactly like that but something like that. There are obviously other things that can affect nonsmoker rates, nonsmoker lung cancer rates.

Q. And you also assume that the relative risk for lung cancer from smoking in ACS II applies to all industrialized countries, is that correct?

A. I'll take ACS II to be CPS II to be correct throughout, without correction.

Q. Yes. Okay. Thank you. Let me rephrase the question.

MR. GROSSMAN: Oh, we have to change tapes. Let's just --

THE WITNESS: Fine.

MR. GROSSMAN: Thanks for the correction.

THE VIDEOGRAPHER: 3:27, going off the record, end of Tape No. 2.

(Recess at 3:27 p.m.)

.

(Resumes at 3:30 p.m.)

THE VIDEOGRAPHER: 3:30, back on the record with Tape No. 3.

MR. GROSSMAN: Thank you.

Q. Professor, let me rephrase the question that

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

was pending.

You also assume that the relative risk for lung cancer from the -- from smoking in CPS II applies to all industrialized countries, is that correct?

A. The relative risk of lung cancer, no. No, not at all. For lung cancer, we'd take the nonsmoker rates in the CPS II study and we say that something like that would be expected if nobody in the -- nobody in the various countries had smoked.

Now, we don't know that the rates wouldn't be somewhat higher or somewhat lower than that in the different countries, but we take it as approximately correct. And because the rates in most countries, you now, the places where people have been smoking cigarettes for some time, are enormously much higher than this, then you can attribute most of that difference, you know, to the effects of tobacco.

But there's no assumption that the relative risk is constant. What we're actually doing for lung cancer is looking at the national rate and comparing it with the rate among American nonsmokers. And you know, if the American nonsmokers' rate is only, say, 10% of the rate in the country as a whole, then it doesn't matter whether the nonsmoker rate in that country would have

http://legacy.library.ucsf.edu/tid/frq07a00/pdf
Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

been exactly the same as the CPS II rate or a little bit less or a little bit more.

You know, it doesn't matter whether it's, say, you know, 7%, 10%, 13% either way, looking the other way around, 87 or 90 or 93% of the lung cancer would be caused by smoking, wouldn't have happened not the population not smoked.

So it doesn't -- so the uncertainties in the nonsmoker rate, you know, a larger relative uncertainty in the nonsmoker rate translates in to a small relative uncertainty in the amount of lung cancer attributable to tobacco. So we're not assuming at all that the relative risk is similar.

Q. All right. Thank you.

(Article marked Exhibit No. 36 for identification.)

Q. Let me hand you what's been marked for identification purposes as Peto Deposition Exhibit No. 36, which is an article by Peter Lee, published in "Regulatory Toxicology and Pharmacology," entitled, "Mortality from Tobacco in Developed Countries. Are Indirect Estimates Reliable?"

I gather that this is hot off the press, Professor. Have you read it before?

http://legacy.library.ucsf.edu/tid/frq07a00/pdf
Document hosted at www.industrydocuments.ucsf.edu/docs/msgl0001

A. No. It looks rather similar to something that something that Peter Lee submitted to the "Lancet."

Q. Now, in Paragraph -- in the paragraph under, "Methods," it says, "The methodology used by ICRF/WHO was obtained from the authors and is described in detail in the Appendix because it was not fully given in their report."

Could you turn to Page 67, the Appendix, "Calculation of Smoking-Attributed Deaths." Does that --

A. I'm going to have to read this.

Q. Yes. I'll ask you the question, then give you time to read it.

Does the Appendix -- well, why don't you read it, and then I'll ask you the question.

A. I've done it. But I haven't actually had time to look through the thing.

MR. PATRICK: You need to review it?

THE WITNESS: Yes, I mean, if questions are asked which I can't do satisfactorily, then --

MR. PATRICK: This must have been just published.

MR. GROSSMAN: Yeah, it was.

Q. Are you ready?

A. More or less, though I would have preferred to

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: https://www.industrydocuments.ucsf.edu/docs/msgl0001

have seen the thing before.

MR. GROSSMAN: All right. I just -- it is -- off the record.

Q. It is just hot off the press. I received it last night.

A. Yes.

Q. But what I had principally planned to ask you about is the Appendix.

Are you ready?

A. Yes, though I'd like to get some -- okay.

Q. Okay. Professor Peto, directing your attention to the Appendix on Page 67 of Exhibit 36, does that Appendix accurately describe the methodology that was used in the Peto, Lopez, et al, book for assessing the mortality from smoking in developed countries?

A. I'm not sure because I've only just seen the thing. I would need to actually sit down and spend some time going over it and really checking it out. I suspect it does. It looks as though there's a typographical error in the table at the bottom of Page 67.

It doesn't give any data for the group of vascular and various other diseases. It seems to be missing the

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

column that would relate to vascular, other medical and so on causes, 5, 6 and 8. And when you turn over the page, all you see is the acknowledgment where financial support was provided by British-American Tobacco, Imperial Tobacco and Rothmans. But you don't see any -- you don't see the relative risks to that last group.

Q. Leaving aside the apparently typographical error of vascular disease and certain other diseases being left off the ACS data chart here, to the best of your knowledge, the Appendix accurately reflects the methodology that was used by you and your colleagues in assessing mortality from tobacco in developed countries, is that correct?

A. At first sight, it appears to. I have not had time to examine it carefully.

Q. Now --

A. I would need to do so privately.

Q. Now, what is referred to here as F is the -- is, in essence, an effective proportion of cigarette smokers in a given society, is that correct?

A. It's probably better to describe it as being just a measure of the extent to which the lung cancer rate in that society, you know, the excess lung cancer

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

rate -- the size of the excess of the lung cancer rate in that society, the excess or the background rate, because I think it's a measure of the intensity of action of cigarette smoking as a cause of lung cancer.

That would probably be a better way of describing it, rather than effective proportions, because otherwise, you --

Q. You think it is a surrogate for determining the number of people who have smoked and the length and intensity with which they smoked?

A. It's the extent to which smoking is causing lung cancer in that population, which is the number who smoked multiplied by the extent to which smoking's causing lung cancer among them.

And so it would also reflect the nature of the materials smoked --

Q. Now, as you --

A. -- and also very much the duration of smoking and the effects of past smoking.

Q. -- as you acknowledge both in the "Lancet" article and in the book, your methodology is novel, as used in this approach, is that correct?

A. Yes.

Q. It -- has this methodology ever been applied

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

to anything other than cigarettes?

A. No. Well, tobacco, rather than cigarettes, I mean, smoking.

Q. And this methodology has provoked some criticism in the press, some lively criticism in the press, by letters to the editor of the "Lancet" and other peer-review publications and the like, is that correct?

A. Let's see. I think it's produced criticisms from two groups of people. There are first, you know, those who've been supported by the tobacco industry, and the second is the group who've very strongly wanted to emphasize the importance of environmental pollutants and who feel threatened by emphasis on the importance of tobacco. So it's those groups in particular.

Q. But the methodology itself has provoked lively comment in the peer-review press, it's fair to say?

A. I'd say on the whole it's been very widely accepted.

Q. Now --

A. I think that it's been -- I think that it's been more notable for its support than for its, you know, for its criticism.

Q. Your method in deriving these numbers is

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

different from the method used by the United States Surgeon General, is that correct?

A. Yes, because the United States Surgeon General is using knowledge of the smoking patterns in the population, and so the proportion of smokers, the proportion of ex-smokers and so on and so forth.

Q. And this method makes no reference at all to the proportions of smokers, proportions of ex-smokers --

A. No.

Q. -- degree to which they inhaled, length of time of their exposure?

A. That's right. It tries to use all -- it tries to use the extent to which smoking is causing lung cancer in that population as a measure of the extent to which that population is being exposed to, you know, tobacco, you know, to the toxins in tobacco smoke.

So it's really using the lung cancer as an indirect method -- as an indirect measure of damage, though it's noteworthy that both we and the U.S. Surgeon General for 1985 made estimates of 400,000.

Q. Now, Mr. Peto, apart from estimating lung cancer deaths in various societies, you attempt to estimate the deaths related to smoking from several

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

other diseases, is that correct?

A. Yes, though not by the same method.

Q. Explain your method for determining the diseases other than lung cancer.

A. The -- well, there's a brief summary of it in Chapter 4 of the monograph.

Q. Yes. On Page A-19 to 20, correct?

A. And there's a fuller statement of it in the "Lancet." And for lung cancer, you essentially compare the national lung cancer death rate with the rate that's been seen -- with the rates seen in the U.S. nonsmokers, and the excess is then attributed to tobacco.

And obviously, the nonsmoker rates would vary somewhat from one society to another if nobody had ever smoked. We don't know what those variations are, and so -- but the relative uncertainties, when there's a big excess, the relative uncertainties in the number of lung cancer deaths attributed to tobacco won't be very big.

You know, as I say, it doesn't matter whether the national rate would have been, you know, 10%, 7%, 13%, I mean it doesn't -- but then, having gotten excess, the excess of lung cancer, we then use this excess of

http://legacy.library.ucsf.edu/tid/frq07a00/pdf http://www.industrydocuments.ucsf.edu/docs/msgl0001

lung cancer indirectly as a guide to the proportions of the deaths from other causes that should be ascribed to smoking.

We take out all the deaths before the age of 35, we ignore deaths before the age of 35. Some of these will be caused by smoking, for example, some infant deaths are caused by smoking, you get some lung cancer and heart disease caused by smoking before the age of 35, but all of this we ignore. So we ignore all deaths before 35. And we ignore all deaths from cirrhosis and from nonmedical causes, accidents, murder and so on.

Then for the other deaths, we look in the -- in the American Cancer Society's -- in the CPS II study, and we see the excess, you know, to what extent is there an excess of these other deaths in the CPS II data, and if the -- let's see.

Q. So for causes other -- let me start that question again.

For diseases other than lung cancer, you use the relative risks from smoking determined by the CPS II study, is that correct?

A. No. We use a fraction of them, which is determined by the size of the lung cancer excess.

Q. You use -- you take a -- you take the relative

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

risk established by the CPS II study --

A. Yeah.

Q. -- the fraction of the society that you believe was injured by cigarettes, as indicated by the proportion of lung cancer deaths to the presumed lung cancer death rate among nonsmokers --

A. Yeah.

Q. -- and you multiply all of that by one half, is that correct?

A. We multiply the odds by one half.

If we're doing stuff on the record, if you ask me the method, I think what I'm going to do, to be careful, would be actually to read out the methods section to answer it. If you want to save time, we could just take that as referenced.

Q. Why don't we save time and take that as a reference.

A. Because I want to be fairly careful about what's said here.

So I would cite as my methods, first, the brief outline on Pages A-19 and A-20 and then the more detailed statement on Pages A-49 and A-50 --

Q. Now, on A --

A. -- in the section entitled, "Methods."

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

Q. -- on A-49, in the section entitled, "Methods," where you say that you have the percentage of nonlung-cancer deaths that --

A. Half the odds.

Q. Yeah, but you have --

A. There's a slight difference between half of the percentage and half of the odds. In other words, half of the odds would make a big difference if you were talking about something that was a small excess.

You'd ignore quite a lot of the things where the excess isn't very extreme, but it wouldn't make very much difference. Whereas, to something like chronic obstructive pulmonary disease, the excess is pretty extreme.

Q. The reason you have the odds is because you understand that there are many confounders for those other diseases, is that correct?

A. It's a general desire to be down at the sort of lower end of what's plausible, rather than to be at the upper end of what's plausible, because when detailed studies are done in particular countries, in some cases these estimates would be found to be too low, in some they may be found to be too high if you didn't do any such halving.

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

And so what I wanted to do was to halve the odds to try and get things so that, you know, that it wasn't going to be shown to be exaggerated, so that future research wasn't going to show that this was exaggerated.

If you used this method, for example, on the CPS II population itself, then it would estimate less than the standard epidemiological analyses would estimate. If we used it on the British doctors study, then these methods would estimate less than would be estimated by the standard epidemiological analyses.

Q. As you say in the "Lancet" article itself, the diseases in question are, to a large extent, diseases for which the possibility of confounding must be allowed for?

A. Yes, in either direction. I mean confounding can go either way.

Q. And that's particularly true in diseases where the excess among smokers is only moderate?

A. Yes.

Q. And there the confounding is likely to reduce the number of people for whose deaths --

A. Not necessarily.

Q. -- you attribute to tobacco, is that correct?

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Stanford Libraries http://www.industrydocuments.ucsf.edu/docs/msgl0001

A. Not necessarily. It doesn't have to reduce it. It could increase it.

Q. But whether it reduces or increases it, actually making the assessment of the confounder would lead to a more accurate number, is that correct?

A. Yes, if you allow for something which is causing confounding, then you're likely, other things being equal, to be nearer to the truth --

Q. And from what --

A. -- if you allow only for the confounding things going one way and not for the confounding things going the other way.

Q. From what guide, if any, did you decide upon the methodology of having the percentage excess?

A. I wanted to do something that was reasonably extreme on the causes of death where the excess was not marked. I wanted to -- I wanted not to really to be in the position of having anything which stood out as being an implausibly large estimate.

I would prefer to have some of the estimates being, if anything, a bit smaller than they should be, which I think, for the chronic obstructive pulmonary disease, these estimates probably are, but rather than having the thing where the estimate could be said to be

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

clearly too big, which I don't think any of these estimates are. I think they're quite reasonably compatible.

Q. As you have said at the top of the right-hand column of Page A-49 and elsewhere, both in the Peto and Lopez book and in the "Lancet" article, this method is essentially crude and arbitrary, is that correct?

A. This halving is a crude and arbitrary way of trying to deal with some of the uncertainties which are involved.

Q. There is not --

A. You don't really know how many deaths you've got in a particular country unless you do studies in that country. That's the thing.

If you want to say about Mississippi, you want to know exactly how many deaths are caused by smoking in Mississippi, then you'd really want to try and get a representative sample of the population of Mississippi, ask them what they smoked, follow them up and count the deaths, and even then you'd have some uncertainty as to how many were actually caused by smoking, how many were not caused by smoking. But you can make reasonable estimates by this kind of method.

Q. There is no generally --

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: https://www.industrydocuments.ucsf.edu/docs/msgl0001

A. In the case of Mississippi, one could do better than this because, in the case of Mississippi, there would be knowledge about the prevalence of smoking, the prevalence of ex-smoking and so on, which for most of these countries we didn't have.

Q. Yes. And so in Mississippi, one could use a different methodology for determining smoking-related illness and death, is that correct?

A. You could make use of methods that do involve knowledge of the proportions who smoke and the proportions of ex-smokers, so presumably those are the methods that are being used by the Plaintiffs. I don't know exactly what methods that are proposing using.

Q. And you would also presume that those would reach more accurate assessments than the indirect estimates that you've conducted without the benefit of information regarding smoking background, inhalation practices --

A. Inhalation, you're never going to really have enough information to --

Q. -- number of people who have stopped smoking, number of people who have started smoking, age of initiation, all of the other factors that are available for the specific population involved?

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

A. Yes, it's difficult to have comparable data on age of initiation, so all you can really get that's comparable from state to state is the proportion of smokers, the proportions of ex-smokers and so on in different age groups. But that presumably will be what is used.

I mean I don't -- I presume that the methods used will be based on the Semek algorithm, is that correct? Well, anyway, whatever the methods are.

MR. GROSSMAN: Okay. And let the record reflect that counsel for the Plaintiffs refused to answer the witness' question.

MR. PATRICK: Let the record reflect that this particular counsel does not know what method we're going to use in particular, so --

THE WITNESS: Yeah, but I mean it will probably be a method that did involve knowledge of the proportion of smokers, in which case, it wouldn't be this method exactly.

Q. Now, in your method, Professor Peto, there was no attempt at all to check against the national smoking rates of the countries involved, is that correct?

A. No. Also, we're not trying to predict the smoking rates with this, with this sort of thing.

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

We're not trying to predict smoking rates because there are differences in the type of cigarettes smoked.

For example, in eastern Europe, the cigarettes are probably considered to be more toxic than the cigarettes now smoked in the United States.

And so we're trying to get the extent to which the population is being -- is having lung cancer caused by smoking as our sort of index, as to the extent to which the population is being hit by tobacco, so it's not really -- think of it as a surrogate, you know, a fraction of smokers.

Q. Even where such data exists, there has been no attempt to check these numbers against the national data?

A. Oh, yeah, where estimates exist, we've tried to match our estimates against other estimates that exist. For example, in the United Kingdom, estimates exist; in the United States, estimates exist; for Australia, the same. And you know, they matched up fairly well.

In the United Kingdom, it's different by about 15%, something like that, I think. Whereas, the United States, it happens just by coincidence, they come almost exactly the same as the Surgeon General's

http://legacy.library.ucsf.edu/tid/frq07a00/pdf
Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

method. The same for Australia and for France, the methods -- the estimates done by Bruce Armstrong and by Katherine Hill came out very similar to our estimates.

But I feel as though, in those populations, it was almost too good to be true, you know, the coincidence was, you know, perhaps lucky, a somewhat lucky coincidence, but at least it indicates that the order of magnitude is correct, which is really what I'm asking for from these methods.

Q. This raises a couple of other issues. You said at the first session of your deposition that there is no epidemiology textbook that you rely upon in your work and that it's your belief that there is no generally accepted scientific method for epidemiology as it's used in the world.

Is it fair to say that --

A. Well, there are certain aspects of what's done that would be generally accepted. But to try and say there's one scientific method which could be used and that that is epidemiology, I mean the key point is to get the totality of the important and relevant evidence available.

Q. And that is largely a judgment call, is that correct?

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: https://www.industrydocuments.ucsf.edu/docs/msgl0001

A. Judgment and discussion, quite a lot of discussion. I mean these sort of things have been talked about with quite a lot of people.

Q. That is, and individual judgment and discussion with some colleagues and to assess their judgment?

A. Yes. There also is the process of publication and the extent to which people accept this.

Q. Now, that raises a point that we were discussing earlier.

Epidemiology has been an evolving field in this century, is that fair to say?

A. Yes, and still is probably.

Q. Excuse me?

A. And still is, I suppose.

Q. It's one that was largely developed in England, isn't it?

A. Quite a lot of the impetus for epidemiology of chronic disease came from England, yes.

Q. It started largely with infectious diseases and then moved to noninfectious diseases, and it's --

A. I don't think I know enough about the history of epidemiology to be able to answer this.

Q. Okay.

http://legacy.library.ucsf.edu/tid/frq07a00/pdf
Source: https://www.industrydocuments.ucsf.edu/docs/msgl0001

A. I mean I know a lot about the history of English epidemiology, but I don't know if certain things were happening in other countries at the same time.

Q. There was a time in or around the mid 1960s when the U.S. Surgeon General published his first report on smoking and --

A. 1964. January, 1964.

Q. -- and when Bradford Hill published his seven-part paradigm for determining causation on the basis of epidemiological evidence that --

A. Yes. I'm not sure of the year in which that was published.

Q. But at around the time when Bradford Hill made his publication and around the time when the U.S. Surgeon General published the first report on smoking and health, the focus of the scientific community was changed somewhat from toxicology to epidemiology in determining causation, isn't that fair to say?

A. I'm not sure. I think probably, yes. I think the whole idea that cancers had avoidable causes was novel.

Q. Excuse me. I don't think I picked up --

A. The whole idea that cancers had avoidable

http://legacy.library.ucsf.edu/tid/frq07a00/pdf https://www.industrydocuments.ucsf.edu/docs/msgl0001

causes was novel. I think cancer was thought to be -- this is from listening to older people talk, I think that cancer was thought to be just a natural concomitant of aging in general, it was just something that happened, you know, your skin went wrinkly and you got cancers and, you know, arteries firmed up and things like this.

The idea that the diseases that caused death in middle age were largely avoidable I think really wasn't commonly understood in the 1930s. So between the 1930s and the 1960s, I think there was a great shift in realizing that any disease that is common in one population is rare in some other population.

Q. And relying upon population-based observational studies, rather than on laboratory studies, in determining cause and effect was an evolving trend in the 1950s and 1960s, is that fair to say?

A. Yes, there were a lot of studies done in the '40s and '50s that were innovative. There were a lot of studies done in the '40s and '50s that were innovative.

MR. GROSSMAN: Yes. Off the record.

Our pronunciation of that word is so different,

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

the American pronunciation is so different that it took me two hearings to -- it's the only word in the entire two days of deposition --

THE WITNESS: Sorry.

MR. GROSSMAN: No. That's our bastardized use of the tongue.

Going back on to the record.

Q. And because those studies in the '40s and '50s were innovative, it took a while for the scientific community as a whole to accept population-based observational studies as a basis of cause and effect, rather than laboratory studies as the principal basis of cause and effect, is that correct?

A. Yes. There was a time when, you know, people were disagreeing as to how valid this was, and then I think the consensus did emerge.

Q. And today you believe that the consensus is that epidemiology is most valuable in determining cause and effect relationships for potentially toxic exposures, that right?

A. That epidemiology is particularly valuable? Yeah, I think that for trying to understand the big causes, yes.

Q. And you believe that there is a general

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

consensus of that, that epidemiology --

A. I don't know whether there's a consensus. There's certainly consensus that epidemiology is sometimes really informative and really important, yes, that consensus exists. What's best or not best, I mean different people are going to think their own thing is the best nearly always.

Q. But there's a far greater consensus for that now than there was in the 1950s, is that correct?

A. I don't know.

MR. PATRICK: I'm going to object.

A. I don't know. I think if you go back to the 1930s, there really wasn't any epidemiology. So if you say the 1930s, yes. The 1950s, I don't know. I think there was quite a lot of excitement about the stuff on lung cancer in the '50s. So in the '30s and '40s, yes.

Q. Now, one of the factors used by epidemiologists in assessing whether they should interpret data as indicating a cause and effect relationship is what's referred to as biological plausibility, is that correct?

A. Yes. It has varying different -- varying roles depending on how strong the association is. I

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

mean you could get overwhelming -- overwhelmingly clear proof of an effect that was extremely surprising.

Q. Well, the factors that epidemiologists typically look at to determine whether a cause and effect relationship exists include strength of association, consistency of association, dose response effect, biological plausibility, temporal association, is that correct, Professor?

A. Yeah. Yeah, these are sort of standard things that are listed, strength, yes. You've got to actually -- the trouble with all of this, though, you have actually got to measure the exposure and, you know, characterize the exposure and the nonexposure reasonably carefully if you're going to -- if you're going to establish some new cause and effect relationship.

I mean when you're trying to look at something which is reasonably well established, then it's not necessary to do such careful -- such a careful evaluation, but I think if you're looking at some new exposure, some new thing that hadn't previously been established, then you've got to think in a lot of different ways about it.

Q. And when you say that, that refers again to

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: https://www.industrydocuments.ucsf.edu/docs/msgl0001

the lack of a single scientific method that is generally accepted by all epidemiologists and that can be checked to determine whether a cause and effect relationship exists?

A. I think it's very similar to, do you have a single scientific method to determine whether guilt exists or not when you actually have a murder trial, and yet, nevertheless, you have trials and you have the determination of guilt and you merely say that there should be proof beyond reasonable doubt of guilt.

Q. Fair enough. It's a judgment that's reached individually or collectively but that cannot be tested in the same way that something in the physical sciences could be tested?

A. I think you can get to a point of proof beyond reasonable doubt, based on the type of evidence that collected epidemiologically. I think there are circumstances where you can get proof beyond a reasonable doubt.

And so I don't know what you mean by testing it, then. You know, if you've really got -- if you've got something that's already proved, then you know, what does it mean to test it?

Q. One of the factors that you consider in

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

determining a cause and effect relationship is biological plausibility?

A. It depends on the strength of the association.

Q. It's one of the --

A. It's one of the things -- I mean if it was logically impossible, then obviously, you -- but I mean, you know, then you wouldn't get a strong association anyway.

Q. It's one of the factors that was listed by Bradford Hill of the seven factors that --

A. Yes.

Q. -- of the seven factors that make up his paradigm?

And it's also one of the factors that was listed by the U.S. Surgeon General in the 1964 Surgeon General's report on smoking and health?

A. Yes.

Q. And it's one of the factors that's generally referred to by epidemiologists as a predicate for a cause and effect relationship?

A. I think I'd sort of put if much more weakly as saying not biological impossibility, you know, so it's actually really very, very weak in that, it's not a

http://legacy.library.ucsf.edu/tid/frq07a00/pdf
Source: https://www.industrydocuments.ucsf.edu/docs/msgl0001

very strict criterion to fulfill.

Q. That's not the way it's generally written, though, is that correct?

A. No. But then, when you look at it, I mean you can -- it doesn't take you long to find a biologically plausible theory for almost anything, so it's a very weak condition in reality.

Q. But as it's applied, whether the relationship between an exposure and a disease is biologically plausible is a matter of judgment for the researcher, is that fair?

A. Yes. But the thing is this isn't really a very strong criterion because you can think of a biologically plausible explanation for almost anything, you know, so it turns out not to be a very informative criterion, and it's --

MR. GROSSMAN: Off the record.

THE VIDEOGRAPHER: 4:10, going off the record.

(Recess at 4:10 p.m.)

(Resumes at 4:24 p.m.)

THE VIDEOGRAPHER: 4:24, back on the record.

Q. Now, Professor, your estimation of lung cancer rates in other countries and your estimation -- let me start this again.

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

Professor, your estimation of smoking-related lung cancer in other countries and your estimation of smoking-related other diseases in other countries both depend upon the accuracy of the nonsmoker lung cancer rates established by CPS II, is that correct?

A. Not very strongly. It would depend very little on this if -- in countries where the lung cancer rate is high. In countries where the lung cancer rate is really low, down towards the nonsmoker rate, then yes, it would.

But in countries where it's high, then it really wouldn't depend very strongly at all on this because it doesn't matter whether you've got, say, a hundred deaths and you subtract off 10, leaving 90; or whether you've got a hundred deaths and you subtract off 5, leaving 95; or whether you've got a hundred deaths and you subtract off 15 leaving 85; it doesn't -- you know, still the total amount that you're attributing to smoking would be about the same. It doesn't -- so it doesn't actually depend very much on extrapolation of the lung cancer -- of the nonsmoker lung cancer rates.

Q. Well --

A. It doesn't really matter what you subtract off. We could have got pretty much the same answer if

http://legacy.library.ucsf.edu/tid/frq07a00/pdf
Source: https://www.industrydocuments.ucsf.edu/docs/msgl0001

we had just taken the total.

Q. Let's see if we can break this down.

Both your attribution of smoking-related lung cancer and smoking-related other diseases is predicated on a formula that begins with the nonsmoking lung cancer rate established by CPS II, is that correct?

A. It begins with the total lung cancer of the country and the lung cancers from CPS II and then subtracts the lung cancer in CPS II from the total. But since what you're subtracting is so small, it doesn't depend much on whether that's a little bit too high or a little bit too low.

Q. If, on the other hand, the nonsmoking-related -- let me start that again.

If, on the other hand, the lung cancer rate among nonsmokers varied with country --

A. Yeah.

Q. -- that would have an effect of inducing error in to the analysis, is that correct?

A. It would have a minor effect because still what you'd be left with -- you're subtracting something small from something large, and so it doesn't matter whether the small thing is exactly right or not.

Q. It depends on how small the small thing is, is

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Stanford Libraries http://www.industrydocuments.ucsf.edu/docs/msgl0001

that correct?

A. In comparison with the large one. In countries where you've got a big excess of lung cancer, it wouldn't matter really whether we chose the CPS II nonsmokers' lung cancer rate or something else.

You're subtracting something small from something large, and so the difference isn't much affected by errors in the something small.

Q. If the nonsmokers lung cancer rate were larger than that represented by CPS II, then your estimates would be too high, is that correct?

A. Say it again. If the nonsmokers --

Q. If the rate of lung cancer among nonsmokers in any country --

A. Yes, in other words, 50% higher in the CPS II. But you know, for example, for the United States it wouldn't make much difference because we're ascribing about the 90% of lung cancer deaths to smoking anyway, as in fact is done by the U.S. Surgeon General in other ways.

Q. But if in fact the rate of lung cancer among nonsmokers in the United States were higher than that determined by CPS II -- let me go back.

Both you and the Surgeon General used the CPS II

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

study to determine lung cancer rates among nonsmokers, is that correct, in the United States?

A. Yes.

Q. And if in fact the rate of lung cancer among nonsmokers in the United States were higher than that determined by CPS II --

A. Yeah.

Q. -- then that would indicate that both your estimate and the Surgeon General's estimates were too high, is that correct?

A. But it would be -- yes, but it would be a small fractional difference.

Q. Depending on the extent to which the estimate of nonsmokers' lung cancer rates was incorrect in CPS II, correct?

A. Yeah, I mean, but even if it was say -- if the truth was 50% higher, you'd still -- you know, you might say that you'd ascribe 85% of all lung cancer to smoking instead of saying 90%. It isn't terribly different really in terms of the total numbers.

Q. And the ratio between -- the ratio between lung cancer rates of smokers and nonsmokers which is used to determine smoking-related injury in your estimate and, thereby, used to determine the degree of

http://legacy.library.ucsf.edu/tid/frq07a00/pdf
Source: https://www.industrydocuments.ucsf.edu/docs/msgl0001

other illnesses caused by smoking, would also be thrown off if, in fact, the nonsmoking lung cancer rate were different, is that --

A. Yeah, but in populations where the lung cancer rate is a lot higher than the CPS II nonsmokers, then the errors would be fairly small, you know, it wouldn't matter -- it would hardly matter if we didn't subtract anything off. You know, it's --

Q. Now, Professor, CPS II is not the only study that has considered the lung cancer rates among nonsmokers in the United States, is that correct?

A. No. You need quite a big study to get an accurate estimate because it's much less common among nonsmokers than in the general population.

CPS I is the other big study, which was also a million-person study in the 1960s, and this in fact observed pretty well exactly the same lung cancer rate in the nonsmokers. CPS I and CPS II saw the same rates.

Q. CPS I studied a similar cohort to CPS II, is that correct?

A. It's not exactly similar, but it would, again, be similar in being probably above average socioeconomic status and educational status, yes.

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

Q. Higher educational status than average, higher income than average, higher health interests than average and perhaps other aspects of lifestyle that are different from the population as a whole, is that correct?

A. I would imagine those would be the differences, yes, in general, that sort of difference.

Q. Now, one other study that was conducted of the lung cancer rate among nonsmokers in the United States is the National Mortality Follow-Back Survey, is that correct?

A. Now, the problem with that is --

Q. Just, is that correct? Is that one other study that was --

A. Well, I'm not sure that it actually studied nonsmokers. It studied people who were said by whoever managed to get interviewed that they didn't know that they had smoked, but it's not clear that it studied nonsmokers.

Q. What about the National Health Interview Survey?

A. Well -- wait a minute. I'm not sure. Which is the one where you're looking back at deaths? That's the look-back study?

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

Q. That's the Mortality Follow-Back Survey of 1986.

A. Yeah, that's the one. But I'm not sure it was studying nonsmokers. You said that also studied nonsmokers. We are not sure they were nonsmokers because you go back and ask whether somebody who's died is a nonsmoker, you're not going to necessarily get reliable information.

You know, the person that you interview may not know that this person has actually been a smoker but had stopped when a lot of people had stopped smoking in the States. There would be confusion between nonsmokers and ex-smokers.

Q. What about the 1987 National Health Interview Survey?

A. This is looking at the prevalent -- this is just a cross-sectional survey looking at the prevalence of various patterns of behavior?

Q. Yes.

A. Yeah, but then that's not looking at lung cancer rates really, is it?

Q. Taking the two together, one can determine the percentage of the population that was nonsmokers and lung cancer rates among them, couldn't one?

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Solutions from www.industrydocuments.ucsf.edu/docs/msgl0001

A. No, I don't think so. How?

Q. Well, Professor, maybe we can approach it this way. You've already said that CPS II was a large survey, but, its size notwithstanding, it was an unrepresentative survey?

A. Yes, I that's right.

Q. And it was not a random survey?

A. That's right.

Q. And because it was neither random nor representative --

A. I'm sorry.

Q. I'll rephrase that question.

In addition to being --

A. Yeah, they could have had lung cancer rates that were systematically different from those of the general population, though I don't see why it should be enormously different.

Q. One way to tell whether the lung cancer rates were systematically different from the general population would be to look at the potential confounders that are included within the survey, such as diet and exercise and family history and the rest and socioeconomic status and to determine whether, after adjusting for those factors, the underlying risk

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

of lung cancer for nonsmokers would be affected, is that correct?

A. So you're trying to say, are there sort of correlates within this study of the nonsmoking lung cancer rates, and if so, are those correlates things that are likely to differ systematically between this survey and the general population?

Q. Yes.

A. Yes, that would be one way of doing it.

Q. And the general population of the United States includes people who have had significant occupational exposures to lung carcinogens, is that correct?

A. Yes, but you don't generally get very much lung cancer for such people if they don't smoke. I mean most occupational carcinogens tend to produce lung cancer in smokers that then multiply up the effects of smoking, one miss-out, mesothelioma here, as not treating that as lung cancer.

Q. Nonetheless, the effect of occupational exposures might increase the rate of lung cancer among the nonsmoking population, is that correct?

A. Not very much.

Q. And to whatever extent it did increase the

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

lung cancer rate among the general population, it would have to be increased to a greater extent among the population of the United States as a whole than among the CPS II cohort?

A. I would expect that to be the case, yes, if it did. But these sort of effects are really going to be very small.

Q. At the first session of the deposition, I presented you with an article by Alavonia regarding saturated fat intake and lung cancer among nonsmoking women in Missouri. Do you recall that?

A. I recall it, yes.

Q. And that study showed a significant increase in lung cancer among women who had a high diet of saturated fat, is that correct?

A. Yes, that's what that study indicated.

Q. There are also studies that have shown a significantly higher rate of lung cancer among nonsmokers who fail to eat green leafy vegetables, correct?

A. Yes.

Q. Candelara study is one of those studies?

A. I think there have been a number of studies of that, and that applies chiefly to smokers. I mean

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

those studies have mostly been concerned with smokers, but presumably the same would be true for nonsmokers, as well.

Q. And there have been studies involving purely nonsmokers that have found a significantly different lung cancer rate among those who ate green leafy vegetables and those who didn't, is that correct?

A. I don't know if there have been some purely among nonsmokers, but I wouldn't dispute the likelihood that such an effect would be seen.

Q. Now, if the CPS II cohort included, by and large, far more people who ate green leafy vegetables than the population of the United States as a whole, that would depress the observed nonsmoker lung cancer rate among the CPS II population compared to the United States as a whole, is that correct?

A. Yeah. Well, this illustrates the -- this illustrates the problems because in those studies, the difference between, you know, the extreme categories would be a relative risk of typically about two thirds. I mean these aren't very extreme differences.

You can find some studies that suggest more extreme differences than that, but then you'd find others that suggest less extreme differences. You

http://legacy.library.ucsf.edu/tid/frq07a00/pdf
Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

know, we're talking about relative risks of the order of two thirds between the extreme categories of vegetable consumption than if you take, you know, just say Gladys Block's review of many such studies for many types of cancer.

And so if there was a difference on average, then it would -- between the CPS II study population and the American population in general, it is not going to be anywhere near as extreme as the difference between the extremes in those studies.

So we're talking about much smaller relative risks. And for saturated fat, I mean we know from studies in the United Kingdom that the APO B in smokers is not much different from that in nonsmokers, again, saying that there's not very much confounding by saturated fat.

So you do have some -- there are going to be some slight differences, but it's not representative. If it had been, then they would have had slightly different lung cancer rates, but not very different. These differences are small. It might have been, say, you know, 10% lower, 10% higher, something like this, but we're not talking about huge differences.

Q. Once again, though, to the extent that the

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

CPS II cohort differs from the United States as a whole in terms of its diet, that could be a factor that depresses the apparent lung cancer rate among nonsmokers, is that correct?

A. Depresses or elevates, I mean it could be either way. I mean the differences in diet, any differences in diet wouldn't necessarily go in the way of depressing it. It might well do. But it wouldn't be enormously different, I would say.

Q. And Professor, at the first session of your deposition, we discussed the relationship between socioeconomic status and lung cancer, and we reviewed studies that show that, after controlling for smoking and diet and occupational exposures and other factors, people from the lowest economic strata or lower economic strata, have a higher incidence of lung cancer than people from upper economic strata.

In inasmuch as the CPS II cohort involves primarily people from the top quintile of the socioeconomic strata, that, too, may depress the apparent lung cancer rate among nonsmokers compared to the United States as a whole, is that correct?

A. Yes, it could do, though, again, the effect is unlikely to be large.

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Stanford Libraries http://www.industrydocuments.ucsf.edu/docs/msgl0001

Q. Now, as a general proposition, one can't import the relative risk for any disease from one country to another, isn't that right?

A. The relative risk or the absolute risk?

Q. The relative risk.

A. Well, we weren't trying to. We were trying to take the absolute risk of lung cancer from one country to another.

Q. You imported the absolute risk of -- you imported the imputed risk of lung cancer among nonsmokers from CPS II --

A. Yeah.

Q. -- compared that with the actual number of observed lung cancers in other countries and then used that, together with the relative risk for other diseases, such as heart disease, to determine the extent of individuals who could be viewed as having had heart disease or the other diseases caused by lung cancer -- by smoking, is that correct?

A. Yes, in outline.

Q. And so the relative risk for heart disease and the relative risk for --

A. Let's just take heart disease particularly.

Q. Okay. So the relative risk for heart disease

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

was imported from the United States to Denmark or Sweden or England or France?

A. Yeah, modified by knowledge of what the local lung cancer rates were.

Q. So it was the relative risk for heart disease combined with knowledge of the local lung cancer rates that led to the determination of the percent of -- of the number of heart disease cases --

A. Yeah, the fraction of heart disease in that country --

Q. -- attributed to cigarettes?

A. -- attributed to smoking.

Q. You have written in the past, though, haven't you, that importing the relative risk for one disease from one country to another country is something of a confidence trick?

A. I don't remember saying that, but I may well have done so. But it's -- that's not what's being done here. We're actually trying to modify the relative risk according to the local circumstances.

So we're trying to -- we're trying to work out some estimate of the extent to which smoking is going to be causing heart disease, let's say, in Britain by knowledge of, you know, how the British lung -- by

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

knowledge of the British lung cancer rates.

Q. Now, Professor, isn't it fair to say that the difference in what you have -- well, I'll first place something before you.

(Chart marked Exhibit No. 37 for identification.)

Q. Okay. Mr. Peto, let me hand you what has been marked for identification purposes as Peto Deposition Exhibit No. 37, which is a chart that we've prepared that compares cigarette consumption per day per adult in four countries and your estimates of cigarette-related death for men in middle age in 1990. This is an extension of the chart that we discussed --?

A. Yeah.

Q. -- at the first session of your deposition?

A. Yes.

Q. Now, Professor, your estimates of cigarette-related death among men in middle age in 1990 show that 11% of the men in Denmark would die during middle age as a result of smoking, 13% of the men in Belgium and, by contrast, 4% of the men in Sweden and 4% in Japan, is that correct?

A. Yes, those were the estimates.

Q. And the smoking histories in those countries

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

are based upon the statistics that you would use, is that correct? That is, they're based upon sales statistics from Wald's article in the book edited by Richard Doll?

A. Yes. I'd perhaps use a rather more extensive time series if that's citing any particular years. If you take a wider range of years, then the contrast between, you know, Japan and Denmark might be rather greater.

Q. Well, the differences in your estimates of cigarette-related death cannot be attributed to differences in cigarette consumption in those countries, can it?

A. Not only to that. It's due to the background rates of various other things together with the duration, the extent or particular duration of smoking.

Q. All right. Well, let's break that down. When you say background rate, you're referring to the rate of lung cancer among nonsmokers?

A. Well, not so much lung cancer. It's the background rates of other diseases.

Q. And the background rate of lung cancer, as well?

A. That we assumed to be similar in different

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

countries, so there certainly aren't differences in that. That's the one that we didn't -- we assumed not to be particularly different.

Q. Well, you assumed it not to be different, but in fact, all of your estimates are driven by the relationship between the presumed background rate of lung cancer and the actual rate of lung cancer found in that country, is that correct?

A. The estimates are driven much more by the absolute rate of lung cancer in those countries. The background is a small fraction of the absolute, so it's driven chiefly by the absolute rate. The background -- so there's not differences in the background rate.

When you're talking about differences in the background rate, we're actually assuming that there aren't any differences in the background rate.

MR. GROSSMAN: Well, let's mark this as Exhibit No. 38.

(Chart marked Exhibit No. 38 for identification.)

Q. Mr. Peto, let me hand you what I've marked for identification purposes as Deposition Exhibit No. 38, and that is a chart that, on top again, shows the cigarette consumption statistics from the Wald article

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

and on the bottom shows the lung cancer death rates in Denmark and Sweden using the numbers contained in the appendix to your book on mortality from smoking in developed countries.

A. This is lung cancer death rate in which year?

Q. In 1990.

A. So that's lung cancer death rate in 1990 is substantially higher in Denmark than in Sweden.

Q. And it is for all-age cohorts within middle age, is that correct?

A. Yes.

Q. Now, Denmark and Sweden are ethnically similar, is that correct?

A. Effectively, yes.

Q. And they're geographically similar? And they also have relatively similar smoking histories over the last half century, is that correct?

A. I'm not sure. I would need to review again the data for Denmark and Sweden on smoking in the past. Denmark has historically had higher lung cancer rates than Sweden --

Q. Based upon the sales data --

A. -- I mean especially in terms of tar levels, now. They're really quite different. I mean the Danes

http://legacy.library.ucsf.edu/tid/frq07a00/pdf https://www.industrydocuments.ucsf.edu/docs/msgl0001

have maintained -- you know, they've used nonfilter cigarettes with fairly high tar levels, whereas, the Swedes have, you know, decreased the tar levels very substantially.

So by 1990, there was a very considerable difference in the types of cigarettes being smoked, and that's specific to Belgium and -- to Denmark and Sweden.

Q. As looking at the sales-weighted data --

A. And the amount and type of cigarette.

Q. Let's break it down in to its component parts.

A. Okay.

Q. Looking at the Wald article's sales data, there is little difference between the number of cigarettes sold per adult in Sweden and Denmark over the last half century, is that correct?

A. In those three particular years, that's true. I would like to look at other years because I remember, after we talked last time, I looked up the data for Denmark and Japan and found that there were quite substantial differences in early years between Denmark and Japan, and so I thought --

Q. Well, where did you get that data for other

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

years?

A. From the monograph published by Oxford University Press, with Professor Wald as co-author of it. It's probably referenced in that -- it's got some double-barreled first author. If you give me that article, I can probably find it in the reference list.

MR. BURNS: Is that the Nicholatti, Spelman book?

THE WITNESS: That's correct.

MR. BURNS: "International Smoking Statistics"?

THE WITNESS: Yeah.

Q. Mr. Peto, assuming that 1965 and 1985 are not for some reason --

A. Atypical?

Q. -- atypical years, what in fact -- I'm sorry.

Assuming that they are not atypical years, the number of cigarettes sold per person in Sweden and Denmark have been largely the same throughout the last half century, is that correct?

A. I think that's really going too far. I think you'd really need to look at -- to look at how -- as to what the pattern is. I think that one ought to -- you know, two or three selected years isn't enough.

And also, I think that the tar levels are very different. I mean the Swedish tar levels are very much

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

lower than the Danish tar levels by 1990. I don't know when that emerged.

Q. Let's break it down, and let's just see if we can break it down.

First, unless the years involved in Professor Wald's chart, 1965 and 1985, are atypical for their periods, there is not a substantial difference in the number of cigarettes sold per person in Denmark and Sweden over the last half century, is that correct?

A. That's quite a big caveat. They may be atypical. If you look here, this is the relevant page from the book -- thank you very much -- and you can see the Danish consumption of manufactured cigarettes running right back to 1920. 1945 was a funny sort of low year after that pattern --

Q. Yes.

A. -- you know, which could finish up looking misleading.

And if you look at all tobacco products, I mean you've got a big break with the second world war, but you've really got a very substantial consumption of tobacco products.

I think Denmark has also got the tradition of the

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Document from www.industrydocuments.ucsf.edu/docs/msgl0001

use of hand-rolled cigarettes. There's quite a lot of hand-rolled tobacco in Denmark, which is grown. I mean that brings back to the uncertainties earlier on.

But I don't think this is such an anomaly, actually, if you look at all that is known about the tobacco use of products in these countries over this century.

Q. We'll break out each part of that. But first, insofar as the sale of manufactured cigarettes is concerned, there has not been a substantial difference between Denmark and Sweden in the last half century, as indicated by the sales numbers referred to by Dr. Wald, is that correct?

A. By those years in particular. The trouble is -- I mean there's certainly a big difference in the composition of the cigarettes between Denmark and Sweden, and I do not know what the historical consumption of cigarettes in Sweden is.

But if you look at total cigarettes in Sweden, for example, the manufactured -- look, here's total cigarettes in Sweden -- I'm sorry -- in -- wait a minute. This is the total cigarettes. I'm getting the countries mixed up and the pages mixed up here. This is getting too hurried to be reliable.

http://legacy.library.ucsf.edu/tid/frq07a00/pdf
Source: https://www.industrydocuments.ucsf.edu/docs/msgl0001

Q. Let me turn your attention back to Exhibit No. 38, if I may.

As demonstrated by the numbers in the bottom of the chart, there is a very substantial difference between lung cancer rates in Denmark and Sweden, regardless of the age cohort, as of 1990, is that correct?

A. There is a big difference in the lung cancer between Denmark and Sweden, yes, in males.

Q. And it made no difference how old the people were between the ages of 35 and 69. The people in Denmark had significantly higher lung cancer rates, is that correct?

A. The differences were more extreme in old age than in early middle age, but I mean it depends on which age group you're in.

Q. But even when one reaches the age group of 50 to 54, which the numbers start to get more significant --

A. 33 versus 59. There's almost a two-fold difference there.

Q. And the next group --

A. There is a two-fold difference.

Q. And the next group, even more than a two-fold

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

difference?

A. Yes.

Q. And in the final group, 65 to 69, again, almost a two-and-a-half-fold difference?

A. Yes.

Q. Those are obviously very significant differences and far more than would be indicated by the sales statistics of manufactured cigarettes, is that correct?

A. Yes, although you've got to look at the history of what people smoked, the manner in which they smoked it, which isn't documented, and also the tar levels of the cigarettes, which are very different between Sweden and Denmark.

Q. All right. Now, you've just testified that one of the factors that may be affecting this is the nature of the cigarettes that have recently been sold in Denmark and Sweden, is that correct?

A. That's one of the factors, yes.

Q. One of the factors that may be affecting this.

In the -- prior to the 1950s and 1960s, cigarettes in all countries were approximately the same, correct?

A. I believe that's true, yes.

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

Q. Certainly prior to the 1960s, cigarettes in Denmark and Sweden were?

A. The manufactured cigarettes would be. The Danes do use quite a lot of hand-rolling tobacco, as well.

Q. Now, I'd like to direct your attention to two pages in the appendix of your book, Page 322 and 496.

Looking at the lung cancer rate among men in middle age in 1955, in Denmark, that rate was what?

A. Do you want to take 35 to 69, the whole -- or just a sort of average?

Q. I think you're on the women's page.

A. Well, no. Men is on the left page, women on the right.

Q. Okay. Page 322, in Denmark, the average -- I'm sorry -- the mortality rate from lung cancer among men between the ages of 35 and 69 was 62.2, is that correct?

A. Yes. That's an average of the rates over a 30-year-age range, but if we want to try and talk sense about things, it might be better to take a particular age range, say, you know, 60 to 64 or 65 to 9 or something like that, 60 to 64.

Q. Okay, let's take 60 to 64 --

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

A. Okay, fine.

Q. -- as you suggested, for 1955.

A. Yeah.

Q. In 1955 --

A. The rate was about 120.

Q. -- the lung cancer rate was 120.5. The similar rate among the Swedish men, on Page 496, was 71.9, is that correct?

A. Yes.

Q. Now, in 1965, the rate among Danish men in the cohort of 60 to 64 was 213.6, is that correct?

A. Yeah, although at which time, it had roughly reached its maximum. I mean it goes 210, 220, 260, 240.

Q. But by 1965, it was 213.6, is that correct?

A. Yes. Whereas, that in Sweden was 82. --

Q. 82.8. And so --

A. So we have about a three-fold difference, two- or three-fold difference.

Q. We have a two- or three-fold difference then, when both countries sold the same sorts of cigarettes?

A. Yes. You've got -- you do have the complication of hand-rolled tobacco in Denmark and also the -- and also what the history of tobacco consumption

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

was earlier in the century.

I mean those lung cancer deaths, say, in 1965, at 60 to 64, I mean these men were born in 1900 or thereabouts, and then they would have started smoking just after the first world war --

Q. The point, though, is --

A. -- and so you really want to know what were the smoking habits among young men between the two wars in those countries.

Q. But looking back at the statistics of the two countries when both countries sold the same kinds of cigarettes, the same relationship as today holds up; that is, that the lung cancer rates in Denmark were two to three times higher than the lung cancer rates in Sweden, is that correct?

A. Yes.

Q. And is it also correct that the charts on the sale of manufactured cigarettes show little difference in the number of manufactured cigarettes sold in Denmark and Sweden at that time?

A. At that time, yes, but that's not the relevant statistic. I mean that's correlating the smoking habits of the grandparents -- of the grandchildren where there's a lung cancer in the grandparents.

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

You want to know the smoking habits -- I mean the people who were in their early 60s in the early '60s were born in 1900. You've really got to look back over what they were smoking throughout their adult lives.

Q. Well, if we look today at your 1990 chart --

A. In what age group?

Q. If we compare the people who are -- if we compare the lung cancer rates among the people who are 65 to 69 and those --

A. At present?

Q. At present.

A. Okay.

Q. -- and those who are 50 to 54, we find that the same relationship still tends to hold up, is that correct?

A. But the rates are higher in Denmark than in Sweden.

Q. Yes, and by a very significant margin, is that correct?

A. Yes.

Q. And this holds up, regardless of the year when the individuals started smoking, when the cohort came of age, and regardless of the --

A. Well, I don't know. It seems to be more

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Document from www.industrydocuments.ucsf.edu/docs/msgl0001

extreme, if anything, in the 65 to 9 than in the earlier age groups.

Q. But that's been true throughout history, hasn't it, that it --

A. Well, the differences, the ratio is more extreme in the 65 to 9 than it is, say, in 50 to 54.

Q. It's two and a half to one, rather than two to one, is that correct? That's what we said before.

A. Well, it's a bit less than two to one at 50 to 54, it's about two and a half to one at 65 to 69, and then it would be about one and a half to one at 45 to 9, and then you run down in to small numbers.

Q. Even in the 40 to 44 --

A. Well, then, you really down in to numbers -- I mean these are small countries.

Q. Almost three to one?

A. Yeah, and then in the other, you'd go 35 to 39, and then it's -- you know, it goes the other way around. I mean 7 versus 12, it's --

Q. These numbers suggest that there may be differences in the background rate of lung cancer between the two countries, don't they? That certainly is an area --

A. No, I don't think so, actually.

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

Q. Isn't that an area that certainly would merit exploration due to these statistics?

A. I think you'd want to -- you'd want to look at the consumption, not only of the manufactured cigarettes, but also of hand-grown tobacco. And you need to look back, not just at three selected years, but particularly at the interwar period.

I mean, 65 to 9, 1990, they'd have been born -- I mean, if they were say 67 years old in 1990, they'd have been -- oh, god, I've got brain failure -- born in 1923, so I guess they'd have been --

Q. They would have been born in 1923, and so they would have come of age around 1940?

A. Yeah.

Q. So the interwar years would be irrelevant, is that correct?

A. Yes, that's right.

Q. And that's precisely why I put together the chart because, remember at the first session of your deposition, in comparing Japanese numbers with Danish numbers, you suggested that we should look at interwar smoking perhaps as a basis for the difference between the lung cancer rates of the two countries?

A. Yes.

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

Q. In fact --

A. And also in the manner in which things are smoked.

Q. Given the age cohorts involved in this group, interwar smoking is irrelevant, is that correct?

A. Correct, yes. This in 1990, yes. I seem to have gotten these numbers right, but there certainly is a big difference between Sweden and Denmark.

MR. GROSSMAN: This is 39.

(Chart marked Exhibit No. 39 for identification.)

Q. Professor Peto, as between Denmark and Sweden, some of the differences in their cultures include a higher fat diet in Denmark, is that true, to your knowledge?

A. I'm not sure. It may well be, yes.

Q. There's a higher unemployment rate in Denmark than Sweden, is that correct?

A. I don't know.

Q. The average socioeconomic status of Swedes is higher than the socioeconomic status of the average Dane, is that correct?

A. I don't know that either. I'm sorry.

Q. There is greater access to social support in

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

Sweden than virtually any other country in the world, is that correct?

A. Social support?

Q. There's greater access to social support in Sweden than Denmark, is that correct?

A. Social services do you mean?

Q. Yes.

A. Friends? What do you mean?

Q. Social services.

A. I don't know that that is true. It certainly has the reputation of having social services.

Q. The Swedish government has affirmatively undertaken significant efforts in preventative medicine, both in warning people of the risks of drinking and driving, of smoking, of industrial accidents and exposures and in general has taken a strong interventionist position in preventative medicine, compared to other countries of the world including Denmark, is that correct?

A. I believe so, yes.

Q. And government efforts in preventative medicine of that kind can bear fruit, as indicated by your suggestion of low mortality in middle age among Swedish men, is that correct?

http://legacy.library.ucsf.edu/tid/frq07a00/pdf http://www.industrydocuments.ucsf.edu/docs/msgl0001

A. I don't know how much government efforts have contributed to that low mortality.

Q. It's fair to conclude, though, isn't it, Doctor -- Professor, that the differences between Denmark and Sweden in lung cancer rate and in other disease rates in middle age and the differences in diet, employment, socioeconomic status, access to social support and social services, financial security and government intervention regarding preventive medicine, merits study to determine the extent to which all of those factors interrelate and merits study to determine the factors that may affect underlying disease rates in the two countries?

A. They would -- would merit study? You can you study so many things in your life, I mean --

Q. Well, let me break it down in to a simpler couple of questions.

Given the differences in disease rates between Denmark and Sweden --

A. Yes.

Q. -- and given the relatively equivalent sales of manufactured cigarettes in the two countries, both at times when the cigarettes were different and at times when the cigarettes were the same, one hypothesis

http://legacy.library.ucsf.edu/tid/frq07a00/pdf https://www.industrydocuments.ucsf.edu/docs/msgl0001

worth investigating would be that nontobacco differences between Denmark and Sweden account for differences in the underlying rate of disease in those two countries, is that correct?

A. There may well be factors other than tobacco that differ substantially between these two countries, although I would expect tobacco to interact multiplicatively with them.

Q. And if there are factors, as between those two countries, of the kind that we discussed, they may affect the underlying rate of nonsmoker disease, including nonsmoker heart disease, nonsmoker lung cancer and nonsmoker emphysema, is that correct?

A. They particularly might well affect the nonsmoker heart disease, yes.

Q. But they might affect all three, is that correct?

A. I see less reason to expect them to affect the nonsmoker lung cancer rates.

Q. But nonetheless, they might, and it's worthy of investigation, is that correct?

A. I'm not sure if it's worthy of investigation or what investigation you propose on doing.

Q. I can't fund these things.

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

Professor, I've placed before you what has been marked for identification purposes as Peto Exhibit No. 39, which is a similar chart, now showing Japan and Belgium in the lower half for age cohorts 35 to 39 up through 65 to 69 with those lung cancer rates taken, again, from your book.

Now, Professor, insofar as cigarette usage is concerned, the Wald article shows that the sale of manufactured cigarettes in 1965 was identical in Japan and Belgium and was almost twice as great in 1985 in Japan as in Belgium, is that correct?

A. Nine a day, as opposed to five a day, in 1985, in that selected year.

Q. And 6.4 per day for both countries in 1965, is that correct?

A. I think I'd prefer to comment -- I'd prefer to comment on the overall pattern of consumption in these countries, rather than just on three selected years.

Q. Well, in inasmuch as those are the three years that are contained in the article that we identified in the first session of your deposition and that you --

A. Yeah.

Q. -- and that you said you rely upon in generating your work, those are the --

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

A. I'd rely on the same sources as the statistics, but it's the -- it would be the overall pattern --

Q. Assuming --

A. -- rather than just that particular year.

Q. Assuming that 1965 and 1985 were not atypical years for purposes of this question --

A. Well, that's the question, isn't it? That's exactly the question. I mean --

Q. For purposes of these questions, let us assume that 1965 was not atypical for its period and 1985 was not atypical for its period, all right? In either Japan or Belgium.

A. Well, if we take 1950, Japan, Belgium and Denmark were about the same, and Sweden was lower.

Q. In terms of cigarette consumption?

A. Cigarette consumption per head.

Q. Okay. So in 1950, as in 1945 and 1965, Japan and Belgium had about the same level of cigarette consumption, is that correct?

A. Whereas, Sweden was lower. So I don't know -- I think -- I don't think you're going to construct some sort of contradiction from particular years. You need -- I really don't think you're going to be able to do

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Document from www.industrydocuments.ucsf.edu/docs/msgl0001

something like this, not in any sort sensible way.

Q. Well, Professor --

A. But carry on.

Q. Professor, let's limit the questioning to the --

A. Okay.

Q. -- the answers to the questions involved and to the chart before us.

You have, first of all, no information that suggests that the trends shown as between Japan and Belgium in consumption on this chart are incorrect, is that correct? Is that right?

A. Japan and Belgium.

Q. And Belgium, the red and green countries.

A. I assume that these are correct for these particular years, and I do not know what the overall pattern is.

Q. And for purposes of this questioning, let us assume that the pattern indicated by these three years remained largely in place; that is, from 1945 to 1965, Japan and Belgium had roughly the same level of smoking, between 1965 and 1985, Belgian consumption began to fall, and Japanese consumption continued to rise. For purposes of this questioning, let us assume

http://legacy.library.ucsf.edu/tid/frq07a00/pdf
Source: https://www.industrydocuments.ucsf.edu/docs/msgl0001

that that is true.

A. I'm not sure that that's a reasonable assumption. I know the Netherlands, for example, again, has a lot of hand-rolled tobacco, and I don't know whether Belgium does the same. I mean part of Belgium is very similar to the Netherlands culturally, and the Netherlands have large amounts of hand-rolled tobacco.

So it may be that these are actually quite misleading, especially if the hand-rolled tobacco is nowadays more toxic than the manufactured, if it is.

Q. Is it your belief that hand-rolled tobacco is more toxic than manufactured, in all likelihood?

A. I think it varies from time to time. I think now that manufactured cigarettes are, you know, very -- you know, they're sort of engineered to try and reduce tar levels, although I think an equivalent of tobacco smoked as hand-rolled cigarettes would probably be more toxic, I think.

Q. Hand-rolled cigarettes don't have expanded tobacco?

A. It depends how much you put in the hand-rolled cigarettes, as well. I mean you can -- you could do a little tiny thing with very little tobacco in it. So I

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

don't think there's any single answer on hand-rolled cigarettes.

Q. Let me ask this: If the State of Mississippi provided to those in its custody who smoked only the paper and plain tobacco for hand-rolled cigarettes, rather than providing them the option of manufactured cigarettes, including low-tar cigarettes, would they be adding to the risk of those within its custody?

MR. PATRICK: Objection to form.

A. If the State provided --

Q. Well, let me make it plainer.

In the Mississippi penal system --

A. Yeah.

Q. -- it's my understanding that, at least in certain places and at certain times, prisoners are not allowed access to manufactured cigarettes, instead they are provided with cigarette paper and rough-grade tobacco.

If, by providing prisoners who have no other options only cigarette paper and rough-grade tobacco, as opposed to modern manufactured cigarettes, if that is what Mississippi is doing, are they potentially increasing the risks of illness to their smoking prisoners, compared to the risks that those prisoners

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

would have if they were granted access to modern manufactured cigarettes?

MR. PATRICK: Objection.

A. I suppose it also depends how many they'd smoke, but -- it depends how many they would smoke.

Q. Assuming the same number of cigarettes smoked.

A. I don't -- again, I think the whole business of the toxicity of hand-rolled cigarettes is difficult. I mean that might well be the case. I don't know. It might well, but I really don't know. I don't know what they'd do, I don't know what sort of stuff comes out of it. It's --

Q. All right. Well, returning now to Exhibit No. 39, first of all, interwar smoking is irrelevant to the cohort that's involved -- the age cohort that's involved in this chart, is that correct?

A. They were looking at people aged under 70 in 1990, then they must have been born after 1920, so the last cohort here is the one that's born in the early '20s. So I mean they could just have started smoking before the second war, but not very likely.

Q. And the cohorts couldn't have at all?

A. Right.

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

Q. That's correct?

A. Yes.

Q. And if one looks, for example, at the age cohort of 60 to 64, the lung cancer rate in Belgium is almost three times as high as that in Japan?

A. Yes.

Q. In the cohort of 55 to 59, the lung cancer rate, again, is more than three times as high?

A. Yes.

Q. In fact, the pattern bears out throughout that the lung cancer rate in Belgium is ten years different from the lung cancer rate in Japan, is that correct? That is, that --

A. Yeah.

Q. -- Japanese lung cancer rates at age 70 are the same as Belgian lung cancer rates at age 60 --

A. Yes, that's about right.

Q. -- or that Japanese lung cancer rates at age 59 are the same as Belgian lung cancer rates at age 49?

A. That looks about right, yes.

Q. Given that it appears that the sale of cigarettes in Japan and Belgium was largely the same until the last 25 years when Japanese sales began to

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

eclipse Belgian sales --

A. We don't know about hand-rolled tobacco. We don't know about hand-rolled tobacco.

Q. Leaving aside the question of hand-rolled tobacco in both countries, are you -- have you studied the history of hand-rolled tobacco in Japan?

A. No.

Q. All right. And is it possible that one difference between reported cigarettes per day in 1955 in Japan and sales statistics for cigarettes in 1955 in Japan is based upon hand-rolled cigarettes in 1955, as smoked by Japanese men?

A. I'm sorry?

Q. Do you recall at the first session of your deposition, you said that the reported number of cigarettes used by Japanese men in 1955 was greater than that indicated by sales statistics?

A. Oh, the self-reported stuff?

Q. Yes.

A. Yes. I think we'll stick with the sales statistics, keeping with those.

Q. Yes. But if you recall, you said that -- you testified that the self-reported number of cigarettes smoked by Japanese men in 1955 exceeded the -- what

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

would be indicated by sales statistics from that time?

A. Yes. I don't know about that particular survey of self-reporting, but --

Q. One explanation for the difference would be hand-rolled cigarettes, is that correct?

A. I believe that that is not correct. I believe that the Japanese, since the war, have used virtually entirely manufactured cigarettes.

Q. But one potential explanation for that difference would be hand-rolled cigarettes, is that correct?

A. I think that's not plausible. I think -- that's easy to check. It was in that particular book. It was easy to check. But I think no.

Q. Although there may be some history of hand-rolled cigarettes in Holland --

A. Very substantial.

Q. -- the -- there is not the same degree of reported incidence of hand-rolled cigarettes in Belgium, is that correct?

A. I'm not sure about that. But again, that's very easy to check. I mean the materials for that are available.

Q. And a substantial proportion of the Belgian

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

population has cultural habits very similar to the habits of northern France, is that correct? The Waloon population?

A. There's quite a difference, actually, across that frontier, and you can see very quite sharp differences across the frontier in some disease rates, so I think maybe no. They speak French, but their culture is different from that of the French or the French population.

Q. Now --

THE VIDEOGRAPHER: I need to change the tape now.

MR. GROSSMAN: Okay. We've only got a few minutes left. We've got to get the professor in his taxi, so --

Q. Okay. Mr. Peto --

A. Another major difference between Belgium and Japan is that in Japan there were quite strict rules against people starting to smoke before adult life, and this didn't apply in Belgium.

Now, how strictly those rules were observed, I don't know. According to Henry Armour, they were observed quite closely until recently. So again, this would have increased the effect of exposure of the Belgian population relative to the Japanese.

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

The other question is the manner of smoking by the Japanese. You know, in what way do they smoke? To the extent are the absolute toxins? The manner of smoking, butt length, the age at starting smoking and also differences in consumption mean that I think these efforts to construct contradictions between the countries really aren't going to come to anything definite. You'll keep thinking I'm trying to avoid answering the question and I won't be.

Q. Professor, if I could direct your attention to your book --

A. Sure.

Q. -- the page after the table of contents, there is a big chart entitled, "Hazards for the Individual Cigarette User."

A. Yes, this would be a sort of average of males and females in various --

Q. The last paragraph in that box contains, in all capitals, in big letters, "Stopping Smoking Works. Even in middle age, stopping before having cancer or some other serious disease avoids most of the later excess risk of death from tobacco, and the benefits of stopping at earlier ages are even greater."

A. Yes.

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

Q. And that is your conclusion, is that right?

A. Yes.

Q. Now, the available sales statistics show that, starting in the 1960s or '70s, the rate of smoking in Belgium sharply decreased, is that correct?

A. I'm not sure what happened in that time. I'm also not sure, if it did happen, whether it was a decrease in the uptake rate.

THE WITNESS: You've got a Belgium graph there somewhere, haven't you?

MR. PATRICK: No.

Q. What is this graph that you're --

A. It's, again, from this book edited by Professor Wald, the title of which you noted earlier on. It would be worth getting the whole book if you want to try and pursue this and looking, although even then you do have real differences.

I mean the inhaler-noninhaler anomaly is a really good striking way of noting that, you know, the way people smoke cigarettes really is different.

And for example, in the United States, there has been the tradition of throwing away quite long cigarette butts. I don't know what the tradition is in Japan.

http://legacy.library.ucsf.edu/tid/frq07a00/pdf
Source: https://www.industrydocuments.ucsf.edu/docs/msgl0001

MR. GROSSMAN: Off the record. You picked up a cold in Asia?

THE WITNESS: Probably. That way, you'd let me end this.

We've got not very much time, so we'd probably better -- let's just move on.

MR. GROSSMAN: Okay. No. We have a little time. Let's return -- may I see that?

THE WITNESS: Sure. That's the reference there. The tables are floating at random out in the front. Have you got the monograph?

I'm sorry. Thanks very much. It doesn't actually contain the-- I'm sorry to have bothered you. It's worth getting that if you want to look at international stuff.

Q. If people in Belgium stopped smoking in the decade before 1990 and if cigarette consumption in Japan during that decade was significantly higher than cigarette consumption in Belgium, one would not expect the Japanese lung cancer rates in every age cohort to be so far below the Belgian age co -- age lung cancer rates, is that correct?

A. We wouldn't have predicted it without actually observing it, no. One would not have predicted that

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Document hosted at www.industrydocuments.ucsf.edu/docs/msgl0001

without actually observing it.

But having observed it, I don't think it's a strong contradiction because I think our predictions are uncertain because of uncertainties in the age starting, the manner of smoking, the butt length, inhalations practices and so on. There are all sorts of differences.

Q. Another uncertainty is the comparative rate of lung cancer among nonsmokers in the two countries, is that correct?

A. I think that's perhaps less of an uncertainty. I mean we do have some knowledge of the nonsmoker lung cancer rates in Japan, and they're fairly similar to those in the United States.

I mean Henry Armour asked a quarter of a million people in Japan what they smoked in 1965 and for about 15 years, and the nonsmoking rates were fairly similar. And the smoker rates started off at about four times the nonsmoker rates and then went about ten times the nonsmoker rates by the time the study ended.

Q. One would need to know the -- it would be valuable to know the nonsmoker lung cancer rates both in Japan and in Belgium, wouldn't it, as a means of comparing the rates of lung cancer in the two

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

countries?

A. Well, it would be nice to know it, but it would be nice to know almost anything.

Q. Now, Professor, your figures that attempt to estimate mortality from smoking in developed countries make no allowance for those diseases that are negatively associated with smoking, is that correct?

A. May be mixed in with the other causes. What, you mean things like Parkinson's disease?

Q. Yes.

A. Yeah, well, they'd be mixed in with the other causes, but they're a very small fraction. If you added up all of them, they'd be about 1% of the deaths caused by smoking.

Q. Let me just go over a couple of these. We covered Parkinson's disease last time.

Ulcerative colitis has been negatively associated with smoking?

A. Yes.

Q. And endo --

A. It causes very few deaths.

Q. -- endometrial cancer has been negatively associated with smoking?

A. Yes, rather more -- fairly weakly so, but yes.

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

Q. Uterine fibroids have been negatively associated with smoking?

A. I believe so, although I haven't examined the evidence myself. They cause virtually no deaths at all.

Q. Down's Syndrome has also been negatively associated with smoking, is that correct?

A. What, do you mean that, if somebody has Down's Syndrome, then they don't smoke?

Q. No. That the birth of children with Down's Syndrome has been negatively associated with the smoking of -- a smoking history of the mother, is that correct?

A. I've never heard that.

Q. And preecclampsia?

A. Yes, that's --

Q. That's negatively associated with smoking?

A. That's, again, said to be negatively associated with smoking, yes.

Q. Now, are you familiar --

A. But that's not going to cause very many deaths, except of the fetus and which it's going to kill almost no mothers.

Q. And Down's Syndrome is a problem of health

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: https://www.industrydocuments.ucsf.edu/docs/msgl0001

costs unrelated to the questions of mortality, is that correct?

A. Well, there's a lot of things. I think, you know, I'd like to know what evidence you have that Down's Syndrome is inversely related to smoking. Is it that smoking actually kills Down's Syndrome fetus or that it's causing problems anyway?

Obviously, it would be related to the age of the mother. I don't know how that relates to smoking. I mean in populations where the young women smoke and the older ones tend not to, then you'd have an association, an inverse association.

Q. Not all diseases obviously have the same monetary costs individually or to society, is that correct?

A. Yes.

Q. The costs -- the monetary costs of individual cases of lung cancer are not as great as the monetary costs of individual cases of Alzheimer's disease, is that correct?

A. That's right.

Q. And the monetary costs of individual cases of lung cancer are not as great as the monetary costs of individual cases of Parkinson's disease, is that

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

correct?

A. I would imagine so, yes. In emphysema, the opposite might well be true.

Q. Let me hand you a copy of the Doll and Crofton "Tobacco and Health" article from the "British Medical Bulletin," January, 1996.

A. Yes. I'm sorry. You just showed me it. Thanks.

Q. Okay. This --

A. And this is referencing the stuff which was studied by Howard Cackel.

Q. Yes.

Professor, have you completed all of the work that you anticipate you'll be doing prior to the trial of this lawsuit related to this lawsuit?

A. That's related to the lawsuit?

Q. Yes.

A. I'm expected, on the lawsuit, to testify on the causal nature of the association between smoking and lung cancer, smoking and the various other diseases that cause death. That's the main thing.

But I was not imagining that the methodology of this book would be the methodology adopted by the State of Mississippi to estimate their actual numbers of

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

deaths, and so I wasn't expecting to testify on this particular methodology.

Q. That's fine. If at any time you are asked to review additional information by the State of Mississippi or to consider additional areas of testimony, or if you decide upon such a course, will you let us know, either directly or through the attorneys for Mississippi, so that we can take --

A. Well, I guess the only thing I'd do would be through the attorneys.

Q. Yes.

A. I think what you'll be asking us to do will -- asking me to do will be just roughly what you outlined in that piece of paper.

MR. PATRICK: Yeah. If we deviate from the statement of expected or anticipated testimony and it becomes our decision to call Professor Peto on other issues, we will certainly let you know.

MR. GROSSMAN: Okay. Well, I promised to get you in a cab at 5:45 --

THE WITNESS: Thanks.

MR. GROSSMAN: -- and I'll try to be a man of my word. So although I've got much more I'd like to ask, I'll have to give up the pleasure of your

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Document from www.industrydocuments.ucsf.edu/docs/msgl0001

company.

THE WITNESS: Thanks very much.

THE VIDEOGRAPHER: The time is 5:37. You're just going off the record?

MR. GROSSMAN: Yeah.

THE VIDEOGRAPHER: We're going off the record at this point.

(Whereupon, at 5:29, the deposition was concluded.)

---

http://legacy.library.ucsf.edu/tid/frq07a00/pdf
Source: https://www.industrydocuments.ucsf.edu/docs/msgl0001

CERTIFICATE

I, the undersigned, PROFESSOR RICHARD PETO, do hereby certify that I have read the foregoing deposition taken on Wednesday, October 23, 1996, and that, to the best of my knowledge, said deposition is true and accurate (with the exception of the following corrections listed below):

Page	Line	Correction

Signed: _____

Date: _____

_____

Notary Public

http://legacy.library.ucsf.edu/tid/frq07a00/pdf Source: http://www.industrydocuments.ucsf.edu/docs/msgl0001

CERTIFICATE

COMMONWEALTH OF MASSACHUSETTS

Suffolk, ss.

I, Debra D. Lajoie, Registered Professional Reporter/Certified Shorthand Reporter #116693, and Notary Public in and for the Commonwealth of Massachusetts, do hereby certify:

That PROFESSOR RICHARD PETO, the witness whose deposition is hereinbefore set forth, was duly sworn by me and that such deposition is a true record of the testimony given by the said witness.

IN WITNESS WHEREOF, I hereby set my hand and Notarial seal this 31st day of October, 1996.

Debra D. Lajoie
Notary Public

THE FOREGOING CERTIFICATION OF THIS TRANSCRIPT DOES NOT APPLY TO ANY REPRODUCTION OF THE SAME BY ANY MEANS UNLESS UNDER THE DIRECT CONTROL AND/OR DIRECTION OF THE CERTIFYING REPORTER

http://legacy.library.ucsf.edu/tid/frq07a00/pdf
Source: https://www.industrydocuments.ucsf.edu/docs/msgl0001

Property of: Ness, Motley
Main PI File Room
Charleston, SC

ROBERT H. LANGE CO., INC.
50 CONGRESS STREET
BOSTON, MA 02109
523-1874

DATE: October 31, 1996

TO: Ness, Motley, Loadholt, Richardson & Poole
Charles W. Patrick, Jr., Esq.
151 Meeting Street, Suite 600,
P.O. Box 1137,
Charleston, SC 29402

RE: MIKE MOORE, ATTORNEY GENERAL ex rel, STATE OF MISSISSIPPI
vs.
THE AMERICAN TOBACCO COMPANY, et al

Dear Mr. Patrick:

Enclosed herewith is your copy of the transcript of the deposition of PROFESSOR RICHARD PETO, taken on Wednesday, October 23, 1996. Also enclosed is the original signature page. Please have the witness read your copy and sign the original signature page and return to this office within 30 days.

Thank you for your anticipated cooperation.

Very truly yours,

Robert H. Lange Co., Inc.

cc: Theodore M. Grossman, Esq.

cc: Keith T. Borman, Esq.

http://legacy.library.ucsf.edu/tid/frq07a00/pdf
Support provided by: www.industrydocuments.ucsf.edu/docs/msgl0001

CERTIFICATE

I, the undersigned, PROFESSOR RICHARD PETO, do hereby certify that I have read the foregoing deposition taken on Wednesday, October 23, 1996, and that, to the best of my knowledge, said deposition is true and accurate (with the exception of the following corrections listed below):

Page	Line	Correction

Signed: _____

Date: _____

_____

Notary Public

http://legacy.library.ucsf.edu/tid/frq07a00/pdf
Source: https://www.industrydocuments.ucsf.edu/docs/msgl0001